Nos. 2015-1410, -1440

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

UNIVERSAL ELECTRONICS, INC.,

Plaintiff - Cross-Appellant,

v.

UNIVERSAL REMOTE CONTROL, INC.,

Defendant - Appellant.

Appeals from the United States District Court for the Central District of California in Case No. 8:12-CV-00329, Judge Andrew J. Guilford

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"CORRECTED" PRINCIPAL BRIEF OF UNIVERSAL REMOTE CONTROL, INC.

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Form 9

FORM 9. Certificate of Interest

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Universal Electronics, Inc. _____ v. Universal Remote Control, Inc. _____

No. 15-1410

CERTIFICATE OF INTEREST

Counsel for the (petitioner) (appellant) (respondent) (appellee) (amicus) (name of party)
Universal Remote Control, Inc. certifies the following (use "None" if applicable; use extra sheets if necessary):

1.   The full name of every party or amicus represented by me is:

Universal Remote Control, Inc.

2.   The name of the real party in interest (if the party named in the caption is not the real party in interest) represented by me is:

Universal Remote Control, Inc.

3.   All parent corporations and any publicly held companies that own 10 percent or more of the stock of the party or amicus curiae represented by me are:

None

4. ☑ The names of all law firms and the partners or associates that appeared for the party or amicus now represented by me in the trial court or agency or are expected to appear in this court are:

Peter Kang, Constantine Trela, Samuel Miller, Theodore Chandler, Teague Donahey, Clarence Rowland, Cynthia Chi, and Anna Weinberg of Sidley Austin LLP; Douglas Miro, Martin Pfeffer, Michael Hurley, and Keith Barkaus of Ostrolenk Faber LLP; Brian Brookey and Steven Lauridsen of Tucker Ellis LLP.

3/18/2015 _____
Date

/s/ Peter H. Kang _____
Signature of counsel

Peter H. Kang _____
Printed name of counsel

Please Note: All questions must be answered
cc: All Counsel of Record _____

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STATEMENT OF RELATED CASES

The only related case is *Universal Electronics, Inc. v. Universal Remote Control, Inc.*, No. 13-0984 (C.D. Cal. filed June 28, 2013). In that case, Universal Electronics, Inc. ("UEI"), is asserting ten additional patents against Universal Remote Control, Inc. ("Universal Remote"), some of which appear to be related to some of the patents asserted in this action, due to an alleged common parent Application No. 07/127,999, filed on Dec. 2, 1987, now U.S. Patent No. 4,959,810.

One other appeal from this action is currently pending before this Court. Universal Remote appealed the district court's partial denial of attorneys' fees. *See* Appeal No. 2015-1561. Universal Remote moved for consolidation of that appeal with this appeal, because if Universal Remote prevails in this appeal, and UEI is guilty of patent misuse and unclean hands, then the district court's partial refusal to award attorneys' fees should be revisited by the district court. *See* Appeal No. 2015-1561 at Dkt. 2. On April 30, 2015, this Court ordered Universal Remote to show cause why Appeal No. 2015-1561 should not be dismissed for lack of jurisdiction. *Id*. at Dkt. 11. Universal Remote responded on May 12, 2015. *Id*. at Dkt. 13. This Court has yet to rule on its order to show cause or Universal Remote's motion for consolidation.

JURISDICTIONAL STATEMENT

The district court had jurisdiction pursuant to 28 U.S.C. §§ 1331, 1338(a),

2201(a), and 2202, because this case was brought alleging patent infringement

under 35 U.S.C. § 271. *See* A2001–02. This Court has jurisdiction under 28

U.S.C. §§ 1295(a)(1) and 1292(c)(2).

The district court entered Final Judgment on January 27, 2015. *See* A2. On

February 26, 2015, Universal Remote filed an appeal from the Final Judgment,

Appeal No. 2015-1410. *See* A26651–53. On March 10, 2015, the district court

entered an order finding UEI liable for part of Universal Remote's attorneys' fees

and expenses, in an amount to be determined later. *See* A21–36. On March 11,

2015, UEI appealed the district court's January 27, 2015 Final Judgment and the

district court's March 10, 2015 Order, which has been docketed as Appeal No.

2015-1440. *See* A26673–74. UEI's Appeal No. 2015-1440 was consolidated with

URC's Appeal No. 2015-1410. *See* Appeal No. 2015-1410, Dkt. 2.

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STATEMENT OF THE ISSUES

1.   Whether the district court erred by waiting until after trial to declare that the jury's verdict finding UEI guilty of laches, equitable estoppel, patent misuse, and unclean hands would be treated as advisory under Federal Rule of Civil Procedure 39(c)(1), despite the prior consent of the parties that the jury's verdict would be binding pursuant to Rule 39(c)(2).

2.   Even if the jury's verdict on the equitable issues was advisory, whether the district court's findings on patent misuse and unclean hands violated the Seventh Amendment by contradicting the factual findings made by the jury in reaching its binding verdict on the legal issue of improper inventorship.

STATEMENT OF THE CASE

A.   Introduction

This appeal stems from a final judgment in one of a series of patent suits brought by UEI against its primary competitor Universal Remote. Universal Remote appeals the final judgment entered after a jury trial, in which the district court disregarded a binding jury verdict in favor of Universal Remote on several equitable issues and instead substituted its own analysis to find in favor of UEI on those issues. The court's decision to disregard the jury's verdict on the equitable issues substantially reduced the attorneys' fees that Universal Remote can recover.

Leading up to the jury trial below, the parties, in various motions and submissions to the district court, addressed which issues should be tried to the jury. The parties, through their words and actions, agreed that the jury would be the final arbiter of *all* issues—except attorneys' fees and costs, which were specifically reserved for the district court at UEI's request. For example, before trial, UEI moved to bifurcate the equitable issues. Universal Remote, in response, opposed bifurcation as contrary to the Seventh Amendment, given that the legal and equitable issues were intertwined, but noted that the district court could consider requesting that the jury issue an advisory verdict on the equitable issues. The district court denied UEI's motion for bifurcation without prejudice, allowing UEI

to re-raise the issue during trial, if UEI so chose, and made no mention of an advisory verdict.

UEI did not renew its motion to bifurcate; instead, UEI changed its strategy and agreed with Universal Remote, both before and during trial, that all issues should be decided by the jury. Neither the district court nor UEI ever mentioned an advisory jury in any of the numerous submissions, orders, and hearings prior to and throughout trial. Following a two-week trial, the jury returned a verdict in favor of Universal Remote on all of the issues, including laches, equitable estoppel, patent misuse, and unclean hands.

After the verdict and despite the parties' prior agreement and its own prior silence, the district court retroactively determined that the jury's verdict on the equitable issues was merely advisory. It then overturned the jury's findings on several of the equitable issues and entered judgment in UEI's favor on those issues.

The law is clear that district courts have the authority to order an advisory jury on equitable issues. But the law is also clear in the Ninth Circuit that district courts must exercise that authority before the trial starts, not after the jury returns its verdict. By waiting until after the jury's verdict to declare, for the first time, that the jury's verdict was advisory, the district court contravened well-established precedent and erred in entering judgment contrary to the jury's verdict. Beyond that, the court disregarded the factual findings implicit in the jury's unquestionably

binding verdicts on the legal issues, thereby contravening the Seventh Amendment even if the jury's verdicts on the equitable issues were properly regarded as only advisory.

Following the trial, Universal Remote moved for attorneys' fees under 35 U.S.C. § 285. The district court granted the motion with respect to the fees Universal Remote incurred defending against UEI's claims that it infringed two of the patents-in-suit, but not the other two, a decision dictated by the court's ruling on the equitable issues. A21–36. If judgment is entered for Universal Remote on its claims of patent misuse and unclean hands, as the jury found it should be, the rationale for limiting the recovery of attorneys' fees would disappear.[1]

B.   Proceedings Below

UEI filed this patent infringement action against Universal Remote on March 2, 2012. A2000–13. The district court issued its claim construction order on February 1, 2013. A37–73. The district court issued two summary judgment orders on March 24, 2014. A16540–90, A16591–605. The jury trial took place from May 7 to May 21, 2014, with the jury finding in Universal Remote's favor on all issues. A31652, A33515, A24520–25. After trial, on December 16, 2014, the district court issued its own findings of fact and conclusions of law on the

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[1] Universal Remote's second appeal, Appeal No. 2015-1561, which is currently pending before this Court, requests that this Court vacate the district court's partial denial of attorneys' fees and remand the case for further consideration of the issue.

equitable issues of laches, equitable estoppel, patent misuse, and unclean hands. A3–20. The court entered final judgment on January 27, 2015. A1–2. On post-judgment motions, the court found the case exceptional in part under 35 U.S.C. § 285, making UEI liable for a portion of Universal Remote's attorneys' fees and expenses, on March 10, 2015. A21–36.

C.   Statement of Facts

1.   The parties and patents-in-suit

This case involves two companies—UEI and Universal Remote—that compete in the business of selling programmable cable TV remote controls, a technology that emerged in the 1980s and has continued to be used in households nationwide. *See*, *e.g.*, A32191:12–19.

UEI is a large, publicly traded company "headquartered not too far" from the federal courthouse in Santa Ana, California, where this action was tried. A31784:5–6. It had 1,988 employees as of March 5, 2015. A26889. It controls 70% of the market for cable remote controls. A33000:8–11. And it has sued Universal Remote multiple times over the years, trying to push it out of business. The long-time CEO of UEI is Mr. Paul Arling. A32464:13–14.

Universal Remote is a small, privately owned company with fewer than 100 employees located in New York. A32196:4–10. Despite its size, Universal Remote has a significant presence in the marketplace; over the past fifteen years, it

has sold millions of cable remote controls to household names in the cable industry, such as Time Warner, Cablevision, and Charter, A32203:5–6, as well as directly to consumers through nationwide retailers, such as Best Buy, Amazon, and Home Depot, A32206:13–15. *See generally* VA1 (video advertisement for Universal Remote's products). Universal Remote has received hundreds of awards and favorable reviews for its remote controls. A32210:19–22. Mr. Chang Park is the founder, CEO, and owner of Universal Remote. A32059:10–14.

Over the last fifteen years, UEI has repeatedly sued Universal Remote, asserting numerous patents covering minor variations on different aspects of a remote control device. UEI first sued Universal Remote in 2000 (hereinafter "the 2000 litigation"), asserting, *inter alia*, claim 1 of U.S. Patent No. 5,414,426, which covers the "favorite channel" button (indicated by the red box in Figure 2 below) on a remote control. A34721–27.
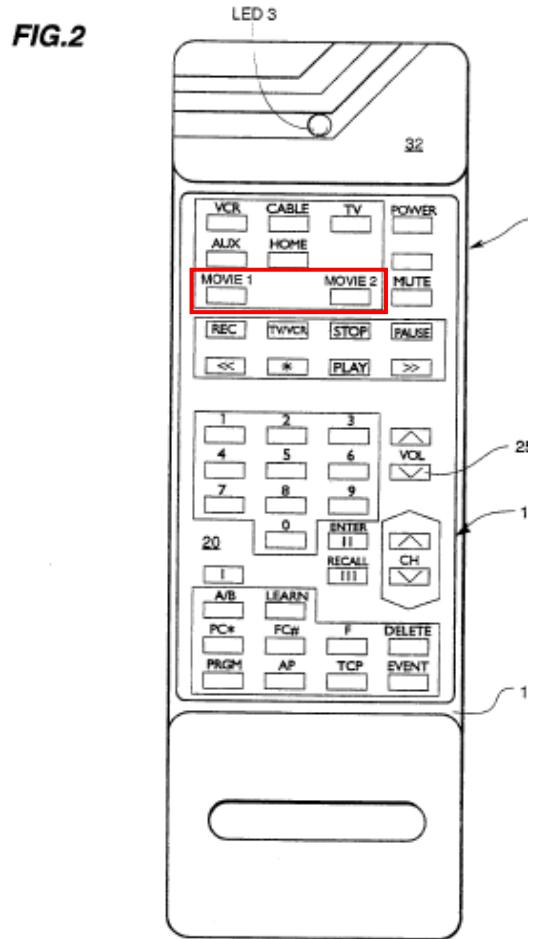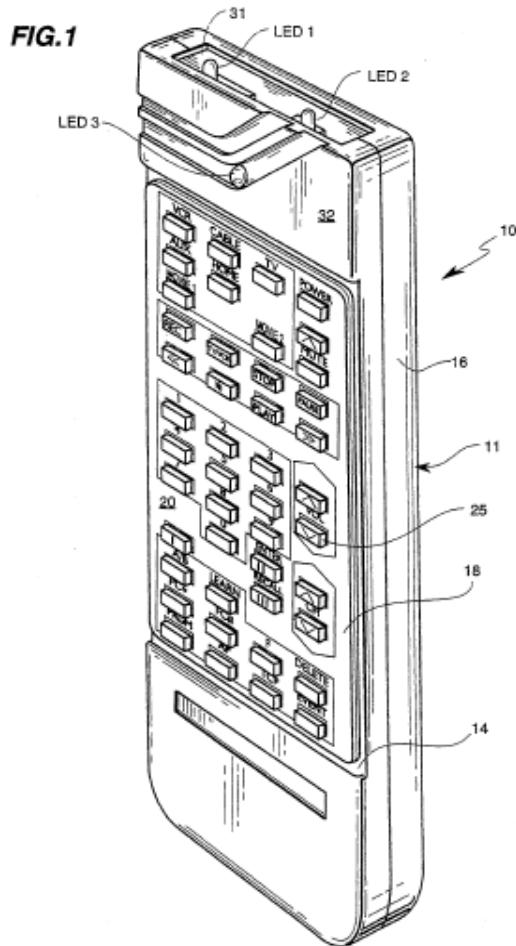
The '426 patent explains, "In the particular implementation of the remote control **10** shown in the drawings, these [MACRO] keys are labeled MOVIE 1 for 'SHOW TIME', for example and MOVIE 2 for 'HBO', for example. These MACRO keys can be colored a special color, e.g., red." A1009(4:64–:68).

In the 2000 litigation, UEI dismissed with prejudice its claims based on the '426 patent and granted a license to Universal Remote for the remaining patents. A35813. During this first lawsuit, UEI's Mr. Arling made clear to Universal Remote's Mr. Park that he wanted to buy Mr. Park's company (thus removing a

competitor from the marketplace). A33118:5–33119:8. Mr. Park rebuffed Mr.

Arling's advances, *id.*, and instead grew his company into a formidable competitor.

On March 2, 2012, UEI sued Universal Remote again. A2000–13. It is this

second lawsuit that is the subject of this appeal. In this second lawsuit, UEI

asserted four patents on remote controls:

- The '426 patent (the same patent asserted in the 2000 litigation),
  which issued on December 11, 1992, and covers the "favorite
  channel" button (shown above). A1000–11.

- U.S. Patent No. 5,568,367, which issued on December 20, 1994, and
  teaches backlighting of the keys when a "light actuation push-button
  24" is pressed (annotated in Figure 1 below). A1018(3:48–54).

FIG. 1
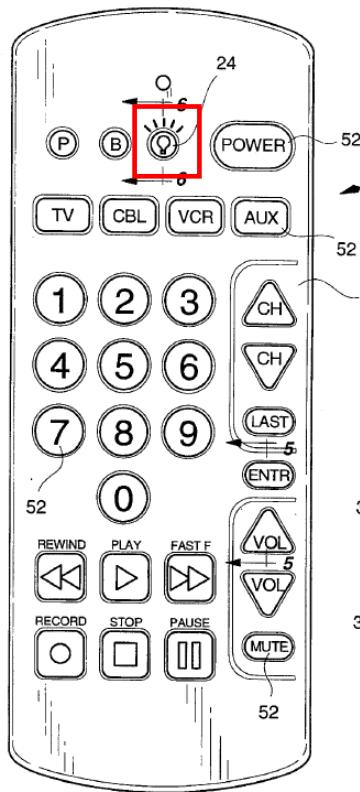
- U.S. Patent No. 6,587,067, which expired five years before the 2012 suit was filed and covered the use of a three-digit code to match a remote control to a particular brand of television. A1051(1:40–60).

- U.S. Patent No. 5,614,906, which issued on March 25, 1997 and covers another method for matching a remote control to a particular brand of television. A1021, A32828:14–32832:15, A32840:2– 32841:12, A24674–76, A24678–79.

See generally A1000–64. During this second lawsuit, Mr. Park, concerned about the high cost of patent litigation, contacted Mr. Arling in June 2013 to attempt a settlement. A33114:12–22. Mr. Arling again made clear that he wanted Universal

Remote out of the cable market, A33116:5–6, and that he wanted to purchase

Universal Remote. A33117:1–13. In response, Mr. Park pointed out that the prior

art invalidated UEI's patents, and Mr. Arling said he would look into it and get

back to Mr. Park, but he never did. A33117:15–33118:3. At the end of June 2013,

Mr. Arling instead filed a third lawsuit against Universal Remote, this time

asserting ten more patents. *See Universal Electronics, Inc. v. Universal Remote

Control, Inc.*, No. 13-0984 (C.D. Cal. filed June 28, 2013). That case is currently

stayed pending *inter partes* review of several of those patents.

2.   Inventorship of the '426 patent

A key issue in both this case and the 2000 case was whether Paul Darbee (a

co-founder of UEI) should be an inventor on the '426 patent.

The application for the '426 patent was filed on December 11, 1992, without

listing Mr. Darbee as an inventor. A34012. On January 19, 1993, the Patent

Office issued a Notice to File Missing Parts and a Notice of Incomplete

Application indicating the inventors' oaths or declarations were missing. A34055–

56. On April 6, 1993, the Patent Office received the inventors' declarations, which

identified three inventors: Frank A. O'Donnell, Quiju Luo, and Kimthoa Nguyen.

A34057–66. Paul Darbee was not named.

On June 14, 1993, the Patent Office, in a Decision On Petition, noted:

A further review of the record reveals that the transmittal letter
submitted on filing lists the names of the inventors as Paul Darbee et

al. A review of the declaration filed February 11, 1993, reveals that *Paul Darbee is not one of the inventors for this application*. The actual names of the inventors are Frank O'Donnell, Qiuju Luo and Kimthoa Nguyen.

A34070 (emphasis added).

On May 9, 1995, the '426 patent issued, and consistent with the Patent

Office's earlier decision, it listed the inventors as Frank A. O'Donnell, Quiju Luo,

and Kimthoa Nguyen. A34019. Paul Darbee was not named.

3.   UEI asserted the '426 patent against Universal Remote in the 2000 litigation

On November 15, 2000, UEI asserted that Universal Remote infringed three

UEI patents, including the '426 patent. *See* A34721–23 at ¶ 8 (Complaint). On

July 3, 2002, Universal Remote sent a letter to UEI explaining that the '426 patent

was invalid in light of prior art from the late 1980s:

> The prior art includes at least the Radio Shack and CORE remote controls sold in 1987 and related documentation; UEI's '810 Patent; issued U.S. patents to Wozniak and Evans; and the Byte magazine article. This prior art individually and collectively invalidates the '426 Patent.

A35824.

On July 23, 2002, UEI claimed that Paul Darbee had been unintentionally

omitted as an inventor on the '426 patent and that adding him would establish an

invention date earlier than the prior art identified by Universal Remote:

> Turning to the '426 patent . . . . it appears that an error was unintentionally made in the inventorship, which we are prepared to

correct. This, of course, will provide the '426 patent with the earliest effective priority date and remove the references you cited as prior art.

A35829.

But UEI never added Paul Darbee as an inventor on the '426 patent, presumably because, after investigating, it or its counsel concluded that it could not legitimately do so. Instead, on October 18, 2002, UEI voluntarily dismissed its claims for infringement of the '426 patent with prejudice (thus sidestepping Universal Remote's challenge to its novelty). A35813.

4.   After the 2000 litigation, Universal Remote succeeded in the marketplace at the expense of UEI

After the 2000 litigation settled, Universal Remote proved to be a formidable competitor. For example, in 2010, Universal Remote won a reverse auction to supply millions of cable remote controls to Time Warner. A36650. UEI lost market share as a result: UEI was "left with . . . California and . . . Hawaii. The rest of the country was URC,"[2] which concerned UEI's executives. A32449:17–22; A32454:5–12. In 2012, shortly before this lawsuit was filed, Time Warner purchased a smaller cable company for which UEI was the remote control supplier, and UEI feared that as a result of the purchase, Time Warner would issue a Request for Quote and that Universal Remote would again be the lowest bidder.

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[2] Universal Remote is often called "URC."

A36644–45. On February 3, 2012, Mr. Lou Hughes, UEI's Senior Vice President,

wrote to Mr. Arling, the CEO:

> I will repeat again so it is really clear. ***I NEED URC to be sued before this Time Warner RFQ comes out***. If this does not happen then there is little value in it for us directly.
>
> We have about three to four weeks now to get this done MAX.
>
> Our backs are against the wall now.

A36644 (emphasis added). Four days later, Mr. Hughes sent a follow-up email to

the CEO of UEI reminding him that it "sure would be good to have the urc thing

filed." A36641.

About a month later, on March 2, 2012, UEI filed suit against Universal

Remote. Internal UEI e-mails indicate that the motive for suing Universal Remote

was to retaliate for lost business and that the suit was a part of a larger effort to

"kill" Universal Remote. For example, in May 2012, Mr. Hughes bragged to other

UEI executives that UEI had taken away one of Universal Remote's customers,

calling this "[a]nother nail in the URC coffin," implying that UEI's lawsuit was the

first nail in the coffin. A36654. A few months later, a UEI Vice President of Sales

wrote to his boss, Mr. Hughes, about "sticking it to URC" and hoping to "kill

them" by taking away even more business. A36660. To which Mr. Hughes

responded, "AWESOME! We are going to get VERY aggressive on this quote.

We are going to push URC's margin and price DOWN. That along with the

current lawsuit should push them to the brink. This will be payback for Time Warner." *Id.*

5.   In the 2012 lawsuit, UEI reasserted the '426 patent and belatedly, and secretly, petitioned to add Paul Darbee as an inventor

This "payback" lawsuit was filed on March 2, 2012 in UEI's hometown in Santa Ana, California. A36644; A2000–13. UEI asserted four patents against Universal Remote, including the same '426 patent it had asserted in the 2000 litigation. *See supra*, pp. 8–10 (citing A1000–64). UEI retained new counsel, Niro, Haller & Niro, Ltd., to litigate the suit in district court. A2000.

When the suit was filed, Paul Darbee was (still) not named as an inventor on the '426 patent, despite UEI's assertion ten years earlier that it could add him as an inventor to get behind Universal Remote's prior art. On July 3, 2012, UEI petitioned the Patent Office to add Darbee as an inventor on the '426 patent, almost 20 years after the Patent Office had specifically pointed out that "Paul Darbee is not one of the inventors." A34251–58. UEI had apparently begun preparing the petition before or immediately after filing its complaint, because some of the signatures on the petition were dated the same month the complaint was filed. A34256–58.

Despite the active litigation, in which Universal Remote was preparing its invalidity case, UEI concealed the petition. A29:17–26. The district court noted

that UEI had submitted a copy of the prosecution history in its initial disclosures—

omitting the petition—to the court on December 19, 2012, and did not otherwise

inform the court of the petition. A29:23–25. Universal Remote discovered the

petition on its own in May, 2013 (ten months after UEI filed the petition).

A29:27–30:1. In response to UEI's petition, the Patent Office took UEI at its word

and issued a certificate adding Mr. Darbee as an inventor on September 3, 2013.[3]

Patrick Hayes, a former UEI employee and paid consultant for this lawsuit,

signed the petition on UEI's behalf and swore that "the omission of Paul Darbee as

inventor when the application was originally filed was not done with any deceptive

intention." A34257; A34258, A31985:3–16. Ms. Nguyen, a named inventor on

the '426 patent and UEI employee, filed a similar declaration. A34256. The

district court explained that those declarations had no basis:

> When Plaintiff filed its petition . . . , Plaintiff represented through
> sworn declarations to the PTO that Darbee had contributed to the
> invention in the '426 Patent. . . . Yet, when responding to
> interrogatories and a motion to compel a year later, Plaintiff claimed it
> did not have specific information regarding Darbee's inventive
> contribution. . . . And, even at trial, Plaintiff did not provide any
> relevant information regarding Darbee's contribution to the invention.

A30:1–8.

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   [3] The certificate can be seen through the USPTO's PAIR database
(http://portal.uspto.gov/pair/PublicPair). UEI never attempted to correct the
inventorship to remove Mr. Darbee after the certificate issued, and thus the patent
still improperly names Mr. Darbee as an inventor.

Indeed, neither Mr. Hayes nor Ms. Nguyen had a good-faith basis to support the addition of Mr. Darbee as an inventor. A24369–70 (clips 6–10), A24371–75 (clips 23–41), A24385–88 (clips 35–46). Mr. Hayes admitted that the only basis for his declaration was the prosecution history (which, as discussed above, states that Mr. Darbee is *not* an inventor) and his discussions with Ms. Nguyen. *See* A24372–74 (clips 28, 35–37); A24376–79 (clips 1–15).

Ms. Nguyen's declaration was equally unsupported. During her deposition, she admitted that she could not recall Mr. Darbee contributing to any of the claimed inventions in the '426 patent, and that she signed the declaration in support of the petition only because Mr. Hayes, her boss, told her to sign. *See* A24383–88 (clips 11–46).

According to the district court, "The videotaped and live testimony of these two witnesses was damning. When testifying on this point, they appeared nervous or combative, and neither could provide any cogent explanation for the 10-year delay in seeking correction of inventorship. They had credibility issues." A11.

UEI did not introduce any rebuttal testimony from Mr. Darbee or anyone else disputing these facts. Mr. Hayes and Ms. Nguyen were in court, *see* A33155:2–5, A33457:6, but UEI did not call either witness in rebuttal. Mr. Darbee passed away shortly before trial, but UEI still had the option of providing testimony from Mr. Hayes and Ms. Nguyen.

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The district court found that UEI had engaged in discovery misconduct with respect to the inventorship issue:

> When [Magistrate] Judge Rosenbluth asked why Plaintiff "couldn't have simply asked [Mr. Darbee or the other inventors] if they remember what their role was and what exactly they did," Plaintiff responded that Darbee was a third-party—even though Darbee was represented by Plaintiff's counsel at his deposition the very next day, and even though Darbee cooperated with Plaintiff in submitting the petition for correction. . . . Judge Rosenbluth characterized Plaintiff's discovery conduct as "playing games" on this point, and determined that Plaintiff's position was "just not credible."

A30:22–28. The district court concluded, "Plaintiff should have simply admitted earlier that it did not have information corroborating Darbee's purported inventive contribution." A30:8–9. Instead, UEI dragged Universal Remote through years of litigation over a patent that was invalid for improper inventorship.

6. Universal Remote's equitable defenses of laches, equitable estoppel, patent misuse, and unclean hands were put to the jury

a. The district court ordered a trial by jury

In response to UEI's complaint, on April 27, 2012, Universal Remote counterclaimed for declaratory judgment of noninfringement and invalidity of all four patents and for breach of the license agreement that ended the first lawsuit, and asserted affirmative defenses including failure to mark, estoppel, laches, unclean hands, claim preclusion/issue preclusion, and patent misuse. A2027–32; A2038–47.

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On July 2, 2012, UEI and Universal Remote submitted a joint Rule 26(f) report "request[ing] a trial by jury." A2086:8–9. The district court then issued a Rule 16 scheduling order stating, "A Jury Trial is set for March 11, 2014 . . . ." A2088; *accord* A2089:17. Neither the parties nor the district court mentioned an advisory jury or a separate bench trial on any issues. The trial date was later rescheduled for May 2014 without any other relevant change to the Rule 16 order. A6646.

b.   The district court ruled in favor of Universal Remote on three of the four patents-in-suit as a matter of law

The parties litigated the case for the next two years. On February 1, 2013, the district court issued an order invalidating the asserted claims of the '367 patent as indefinite, leaving three patents in the case. A56:10–11. After the close of fact discovery, UEI moved for summary judgment on Universal Remote's equitable defenses, and Universal Remote moved for summary judgment of, *inter alia*, invalidity and non-infringement of the remaining three patents-in-suit.

On March 24, 2014—approximately six weeks before trial—the district court partially granted UEI's motion, narrowing Universal Remote's equitable defenses. The court determined that Universal Remote's patent misuse theory could not proceed on the bases of UEI's inequitable conduct or UEI's ongoing assertion of a patent without any evidence of direct infringement. A16601–04.

But the court found there was sufficient evidence that a "jury" could find patent misuse based on improper inventorship, A16598, laches and estoppel, A16599–600, and *res judicata*, A16600. The district court also granted Universal Remote's motion for summary judgment of non-infringement and failure to mark with respect to the '426 patent, A16568–70, and failure to mark with respect to the '067 patent, A16582–89, which effectively rendered the '067 patent useless to UEI (because it had expired five years before suit was filed).[4]

As a result of these rulings, the only patent left for UEI to try was the '906 patent. But Universal Remote still had its equitable arguments, including laches, equitable estoppel, patent misuse, and unclean hands with respect to all of the patents.

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c.   Neither the district court nor the parties requested an advisory verdict on the equitable issues prior to or during trial

i.   <u>Motions in limine and the final pretrial conference</u>

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On April 7, 2014, UEI filed several motions in limine, including Motion in Limine No. 7, which sought to preclude Universal Remote from presenting its

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[4] Notably, the Patent Office found all claims of the '067 patent invalid in its final decision on Universal Remote's petition for inter partes review. *See Universal Remote Control, Inc. v. Universal Electronics, Inc.*, IPR2013-00127 (PTAB June 30, 2014), Paper 33. Thus, all four of UEI's asserted patents have been found invalid.

unclean hands defense at trial. UEI explained that "testimony, evidence, or argument relating to any unclean hands defense" would be "confusing and potentially prejudicial" to the jury, and it would be improper in light of the district court's summary judgment ruling. A17329:2–9. UEI also argued that evidence related to unclean hands should be excluded from presentation to the jury because unclean hands is an equitable defense for the court to decide. A17334:16–19. On April 14, 2014, Universal Remote filed its opposition to the motion and argued, among other things, that even if unclean hands is an issue for the court to decide, the evidence could still be presented to the jury because "at the Court's request" the jury may issue an advisory opinion. A21565:14–22. The court never made such a request. The district court denied UEI's motion in limine, deeming it nothing more than a "belated motion for summary judgment," without addressing how unclean hands would be tried. A21970.

On April 17, 2014, the parties filed a Proposed Final Pretrial Conference Order, in which they jointly stated: "This trial is to be a jury trial." A21832:22–23, A21834:23–24. UEI requested bifurcation of certain issues, including improper inventorship, unclean hands, and patent misuse. A21845:14–21847:2. Universal Remote opposed, arguing that the facts relevant to the legal and equitable issues were intertwined, and thus it would be inefficient and a violation of the Seventh Amendment to have separate trials. A21847:3–21848:3. Universal Remote again

noted that the district court could, in its discretion, empanel an advisory jury, *see* A21847:18–20, but neither Universal Remote nor UEI ever requested one, and again the court did not order one.

During the April 21, 2014 final pretrial conference, the district court deferred ruling on UEI's request for bifurcation of the equitable issues, inviting UEI to renew the request during trial (which UEI never did):

> THE COURT: All right. Here's what I'm going to do on the issue of bifurcation. I'm going to be **withholding judgment** at this time, but here are a few parameters for my ultimate decision on bifurcation. The papers kind of look like they were using bifurcation to grab an extra four days for our eight-day trial. Bifurcation will not be a vehicle to extend the eight days. It will not be a vehicle to extend the eight days. As the trial progresses, **if the plaintiff wishes near the end of the trial to go into a Court-Only mode, I will consider that possibility**. That's my view right now. We can revisit it during the course of the trial. All right. So we'll start the trial with the jury on that Tuesday. We'll get going. **If the plaintiff can stand up and make a good argument that this is a portion of the trial we don't need the jury, I will listen to that argument.** I will not be sympathetic to that being a vehicle to lengthen the eight days. That is the best I can do on bifurcation.

A31476:16–31477:8 (emphases added). UEI confirmed that it understood the district court's resolution of the matter. A31477:10. With respect to the proposed pre-trial order submitted by the parties, the district court explained that "I'm not prepared to totally sign off on the pretrial conference order at this time." A31460:7–8. In fact, the district court never signed the proposed pretrial conference order. Instead, the district court issued a minute order stating, "Trial remains set for May 6, 2014 at 9:00 a.m." A530 (Dkt. 330). And on April 23,

2014, the court issued an "[In Chambers] Order Re Trial Timing And Procedure" that was silent on the bifurcation issue and the possibility of an advisory verdict with respect to any issues submitted to the jury. A22002.

After the final pretrial conference, UEI never tried to renew its request to bifurcate the equitable issues, and never suggested that the jury's verdict should be advisory. Instead, UEI (along with Universal Remote) pursued a binding jury verdict on all issues.

ii.   UEI's trial brief, proposed jury instructions, and proposed verdict forms

UEI's pretrial filings related to the conduct of the trial provide further evidence of its strategic decision to seek a binding jury verdict on all issues (except *res judicata*, attorneys' fees, and costs, which it explicitly carved out). On April 29, 2014, UEI filed a Trial Brief which argued that the issue of attorneys' fees and costs under sections 285 and 1927 should not be tried to the jury, A22065:4–16, but which did not dispute that the equitable issues should be decided by the jury, A22070:1–22075:2. For example, UEI argued, "there is no remaining legal basis for the *jury* to render the '906 patent unenforceable." A22074:2.

UEI also proposed jury instructions and verdict forms that asked the jury to decide the equitable issues of patent misuse, laches, estoppel, and unclean hands. A22083–89. UEI agreed with Universal Remote on the jury instruction for laches,

A23382–84, and submitted competing jury instructions on patent misuse, equitable estoppel, A23455–58, and unclean hands, A23461–62. UEI objected to the wording of Universal Remote's proposed jury instructions on the equitable issues, A23547–57, A23561–64, but in none of its filings did UEI object to a binding jury verdict on the equitable issues. Instead, UEI conceded that patent misuse should be decided by the jury: "UEI objects to *res judicata* being tried by the jury. It is solely a determination for the Court. However, UEI submits this instruction in an effort to provide the jury with context from which to decide URC's patent misuse defense." A23459 n.1. Universal Remote requested an advisory verdict on obviousness, but did not request an advisory verdict on patent misuse or unclean hands. A22092:8; A22095.

Prior to the jury's verdict, the district court never mentioned the prospect of an advisory verdict. For example, on May 6, 2014, the district court held a day-long hearing to resolve disputes regarding the jury instructions. A31490. During the hearing, the parties debated the instructions on patent misuse, equitable estoppel, and unclean hands. A31586–94. Throughout this hearing, spanning over 150 pages of transcript, the only mention of an advisory verdict was by Universal Remote, and only with respect to obviousness. A31507:9–17. UEI and the court never mentioned an advisory jury for any other issue.

In its final determination of jury instructions, the court made no mention of an advisory jury, including with respect to the equitable issues. A23768–71. The court adopted UEI's proposed instruction on patent misuse and adopted the Federal Circuit Bar Association Model Instruction 5.5 on unclean hands, which was similar to UEI's proposed unclean hands instruction. *Id*.; *compare* A1551 (final unclean hands instruction) *with* A23461 (UEI's proposed unclean hands instruction).

iii.   Trial

Trial by jury started on May 7, 2014. On the second day of trial, the district court—apparently still expecting that UEI would request bifurcation of the equitable issues—made several passing references to itself as the "trier of fact" while discussing disputes over deposition designations. A31879:21–80:11; A31887:12–24; A31889:4–31890:10; A32036:17–32037:2. For the remainder of trial, the court never again referred to itself as the "trier of fact," and UEI did not renew its request to bifurcate the equitable issues. Instead, the parties tried all of the equitable issues to the jury, and at no point during the trial did either party or the court state that the jury's verdict would be advisory.

During trial, UEI filed a Rule 50(a) motion, arguing that Universal Remote had failed to prove laches, equitable estoppel, or unclean hands. A24448–53. The motion did not suggest that the jury's verdict would be advisory. To the contrary, UEI argued at a hearing that if the court were to "deny our motion and judgment as

a matter of law on these two issues [*i.e.*, laches and equitable estoppel], ***they ought to go to the jury***." A33355:7–9 (emphasis added).

The jury returned a verdict in favor of Universal Remote on all issues—noninfringement, anticipation, obviousness, improper inventorship, laches, estoppel, patent misuse, and unclean hands. A1500–05. After the jury returned its verdict, the district court *sua sponte* announced for the first time that it would treat the jury's verdict on the equitable issues as advisory:

> THE COURT: . . . The jury has spoken in this system. I realize there might be follow-up motions with me, even on the equitable grounds. I need to sort out what the equitable issues are that we've occasionally talked about. In light of this verdict, to the extent there were equitable issues, ***we all know those were advisory***. I invite you to maybe talk among yourselves what the schedule will be for future motions and such. . . .

A33529:12–18 (emphasis added). The parties did not object to releasing the jury, and then the district court ordered "the parties to talk about what kind of motion practice might follow, what is the effect of the lingering potential equitable issues or anything else that may need to be decided," and concluded "[w]ith that, ladies and gentlemen, we are done." A33529:23–33530:8.

7.   The district court treated the jury's verdict as advisory and overturned the jury's findings of equitable estoppel, patent misuse, and unclean hands

Following the court's unprompted statement that the jury verdict was advisory, "the parties propose[d] that the Court reserve entry of judgment on all issues until the parties have briefed which issues were equitable and if so how the Court should resolve those issues." A24878:17–19.

After briefing—in which Universal Remote argued that the jury's verdict on the equitable issues had been binding and not advisory—the district court held a hearing on the equitable issues. A33531–66. The district court told Universal Remote's counsel, "part of your problem is you are arguing against my recollection and understanding of how we were going." A33535:6–8. The district court further reasoned that "[t]he status quo is that equitable issues go to the court; correct?" A33544:14–15; *see also* A33544:19–20. Universal Remote's counsel explained that the status quo is determined by the Rule 16 order, but the district court disagreed:

> That's not the status quo. The rule 16 order is a rule 16 order. And you are reading far more into that order which is really designed to let us know if we have to pull up a jury on the first day of trial.

> When we put jury trial on that, we're not necessarily precluding – it's not our intent to preclude that there might not be equitable issues to be determined by the court such as injunctive relief or whatever. I'm saying you are reading a lot into that.

But putting that aside, I view the status quo, if nothing else is said or done, is that legal issues go to the jury and equitable issues go to the court.

A33544:19–33545:9. Subsequently, the district court issued an order determining that the jury's verdicts on laches, equitable estoppel, patent misuse, and unclean hands were advisory under Rule 39(c)(1), rather than binding under Rule 39(c)(2).

A3. The district court reasoned the verdict was advisory because:

The Court heard the trial and knows what happened. Throughout the trial, numerous references were made concerning the Court being a "partial trier of fact," and the Court itself made this exact statement. No objection was made, and this was the common understanding. The jury's verdict on the equitable issues was advisory.

A3. The district court issued its own findings of fact on the equitable issues. While it agreed with jury's verdict on laches, A12–14, the district court disagreed with the jury on equitable estoppel, patent misuse, and unclean hands, A16–20.

On March 10, 2015, the district court determined that the case was exceptional under 35 U.S.C. § 285 and ordered UEI to "pay for the portions of the case attributable to the '426 and '067 Patents, and the motion for reconsideration regarding the '367 Patent," but the court did not order UEI to pay the attorneys' fees and expenses that Universal Remote had incurred for the remainder of the case. A22–35.

Universal Remote spent approximately $9 million to defeat UEI's claims of patent infringement, A26693:11, an amount consistent with surveys of the cost of

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patent litigation, A26878–9. Universal Remote's annual cable net profits are less than $3 million per year. A34992.

The district court has yet to rule on the amount of fees and expenses that are necessary to compensate Universal Remote for UEI's misconduct.

SUMMARY OF THE ARGUMENT

Rule 39 provides several mechanisms for resolution of equitable issues—they can be tried to a binding jury verdict, to an advisory jury verdict followed by a decision from the court, or in a separate bench trial. Decisions by this Circuit, as well as the Third and Sixth Circuits, have held that where the parties fail to object to equitable issues being tried to the jury, and the district court does not declare prior to trial that a verdict will be advisory, the jury's verdict will be binding—not advisory. And the Ninth Circuit's decision in *Pradier v. Elespuru*, 641 F.2d 808 (9th Cir. 1981)—binding here because this is a procedural issue not unique to patent infringement litigation—requires the court to tell the parties before the trial begins whether the jury's verdict will be advisory. The district court ignored this deadline—waiting until *after* the jury returned a verdict in Universal Remote's favor on all counts before declaring, *sua sponte*, that the verdict in fact had been only advisory. The Third Circuit in *Bereda v. Pickering Creek Indus. Park, Inc.*, 865 F.2d 49 (3d Cir. 1989), and the Sixth Circuit in *Thompson v. Parkes*, 963 F.2d 885 (6th Cir. 1992), considered similar fact patterns and both reversed.

Here, prior to trial, the district court never explicitly addressed whether the jury's verdict on the equitable issues would be advisory or binding. Instead, the district court authorized a trial procedure under which UEI had only two options for resolving the equitable issues once trial began: (1) UEI could renew its request

for a bifurcated trial, meaning the equitable evidence would not be presented to the

jury and the jury would render no verdict on the equitable issues, or (2) UEI could

submit the equitable issues to the jury for a binding verdict. UEI chose the latter

option. An advisory verdict was off the table once trial began because, as required

by *Pradier*, the court did not order an advisory verdict prior to trial.

UEI's failure to request either a bench trial or an advisory verdict on the

equitable issues was not inadvertent. Rather, UEI's conduct prior to and during

trial reflects its deliberate, strategic decision to consent under Rule 39(c)(2) to

submitting all of the issues, including the equitable issues, to a ***binding*** verdict by a

hometown jury. UEI did not once request or even mention an advisory verdict on

the equitable issues until after the jury had returned its verdict, and then only after

the court *sua sponte* raised the issue. And UEI had a host of opportunities to do so.

For example, in its jury instruction briefing, UEI demanded that *res judicata* be

tried to the judge alone, but omitted any parallel demand for a bench trial or

advisory verdict on the equitable issues. Instead, UEI submitted jury instructions

and verdict forms on all issues, legal and equitable alike (except attorneys' fees

and costs). Then, after its case was underway in front of the hometown jury, UEI

decided to waive its request for bifurcation of the equitable issues. UEI went

further and filed a Rule 50(a) motion for judgment as a matter of law on the

equitable issues, a motion that, by definition, applies only to issues being submitted

for a ***binding*** jury verdict.

The court's and UEI's failure even to suggest that the verdict on the

equitable issues would be advisory stood in stark contrast to Universal Remote's

efforts to raise the issue. The facts underlying the equitable issues were

intertwined with legal issues on which Universal Remote had a right to a jury trial.

Thus, Universal Remote pressed, prior to trial, for a unified presentation of all

evidence on all issues to the jury. In so doing, Universal Remote repeatedly

reminded the court and UEI that the court had the discretion to order an advisory

jury verdict on the equitable issues. Despite Universal Remote's prompting, the

district court and UEI were silent on the issue, and never mentioned utilizing an

advisory verdict, until after the jury returned its verdict. Under these

circumstances, the jury's entire verdict was binding under *Modine Mfg. Co. v.*

Allen Group, Inc., 917 F.2d 538 (Fed. Cir. 1990), as well as *Bereda* and *Thompson*,

and it should be reinstated.

Even if, *arguendo*, the district court correctly held that the jury's verdict was

advisory, this Court should nonetheless reverse the district court's findings of no

patent misuse or unclean hands. In ruling against Universal Remote on those

issues, the district court failed to follow the factual findings implicit in the jury's

verdict on improper inventorship. Under the Seventh Amendment, when a jury

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issues a verdict on a legal issue, the district court must accept the jury's implicit and explicit factual findings when ruling on any equitable issues. Here, the jury implicitly found that UEI's petition to name Mr. Darbee as an inventor on the '426 patent was made in bad faith and with an improper motive, namely to push Universal Remote out of business to increase UEI's monopoly power in the market for remote controls. The district court should have followed those findings in assessing patent misuse and unclean hands, and if it had done so, it would have been required to enter judgment for Universal Remote on those issues.

ARGUMENT

I. Standard Of Review

This Court reviews procedural rulings that are not unique to patent litigation under the law of the regional circuit—in this case, the Ninth Circuit. *Sun Studs, Inc. v. Applied Theory Assoc.*, 772 F.2d 1557, 1566 (Fed. Cir. 1985). Questions of law are reviewed *de novo* in the Ninth Circuit. *Societe Civile Succession Guino v. Renoir*, 549 F.3d 1182, 1185 (9th Cir. 2008).

II. The Jury's Verdict Was Binding

Contrary to the district court's post-trial order, the jury's verdict on the equitable issues was binding by consent under Rule 39(c)(2) and ***not*** advisory under Rule 39(c)(1).

First, the parties consented to a jury verdict on the equitable issues, triggering application of Rule 39(c)(2). The onus was on UEI to object to the

verdict being binding—not on Universal Remote to object to the verdict being advisory. *Cf.* A33545:10–11. UEI's failure to request an advisory verdict was not an oversight; Universal Remote flagged several times, for UEI and the court, an advisory verdict as a potential resolution of the parties' pre-trial disputes over the equitable issues. With full knowledge of this option, UEI made a deliberate, strategic choice to submit its case to a binding jury verdict on all issues. While UEI made clear that it did not want the jury to hear the evidence on the equitable issues, UEI also made clear that if the jury did hear the evidence, then UEI preferred that the hometown jury issue a binding verdict. Indeed, not once did UEI use the phrase "advisory verdict." It was only after the jury ruled against UEI, and with the court's prompting, that UEI switched horses.

Second, the district court ordered a jury trial on all issues. Although the order was silent as to whether the verdict on the equitable issues would be advisory or binding, the rule in the face of such silence is that the verdict is binding where the parties consent to a binding verdict. Despite Universal Remote's pretrial submissions noting the option of an advisory verdict, the district court did not order or mention an advisory verdict under Rule 39(c)(1) until *after* the jury returned its verdict. This is plainly prohibited under binding Ninth Circuit law.

A. Jury verdicts are binding where the parties consent and the district court does not order an advisory verdict

The Federal Rules of Civil Procedure provide three ways an equitable issue can be decided: (i) by the judge in a bench trial pursuant to Rules 39(b) or 42(b), (ii) by the judge in a trial with an advisory jury pursuant to Rule 39(c)(1), or (iii) by the jury with the consent of the parties pursuant to Rule 39(c)(2).

There clearly was not a bench trial under Rule 39(b)—UEI waived the opportunity to renew its request to bifurcate certain issues for a bench trial. *See infra*, p. 41. Thus, the only question is which subsection of Rule 39(c) applied in view of the parties' and court's conduct. Rule 39(c) states:

> (c) ADVISORY JURY; JURY TRIAL BY CONSENT. In an action not triable of right by a jury, the court, on motion or on its own:
>
> > (1) may try any issue with an advisory jury; or
> >
> > (2) may, with the parties' consent, try any issue by a jury whose verdict has the same effect as if a jury trial had been a matter of right, unless the action is against the United States and a federal statute provides for a nonjury trial.

Where the district court does not order an advisory verdict, and the parties do not explicitly object to a binding verdict or request an advisory verdict, then the jury verdict on all issues submitted to the jury will be binding under Rule 39(c)(2). *See Modine Mfg. Co. v. Allen Group, Inc.*, 917 F.2d 538, 541–42 & n.2 (Fed. Cir. 1990) (applying Ninth Circuit law); *Bereda v. Pickering Creek Indus. Park, Inc.*, 865 F.2d 49, 52–53 (3d Cir. 1989); *Thompson v. Parkes*, 963 F.2d 885, 886 (6th

Cir. 1992); *Broadnax v. City of New Haven*, 415 F.3d 265, 271–72 (2d Cir. 2005) (holding "it was not reversible error for the district court to submit to the jury the non-advisory determination" of the equitable issue where defendant "failed to object" to sending an equitable issue to the jury).

Under Rule 39(c)(2), "consent need not be express. If one party demands a jury, the other parties do not object, and the court orders trial to a jury, then this situation will be regarded as a jury trial by consent. If there is a trial to a jury by consent, then the verdict has the same effect as if the trial by a jury had been a matter of right and cannot be treated as advisory only." 9 Wright & Miller, *Federal Practice and Procedure* § 2333, at 297 (3d ed. 2008) (collecting cases).

In *Modine*, for example, this Court held that the defendant's failure to object should be treated as consent under Rule 39(c)(2) to a binding jury verdict. 917 F.2d at 542 n.2. There, the district court submitted the equitable issue of inequitable conduct to the jury, and the jury found no inequitable conduct. *Modine Mfg. Co. v. Allen Group, Inc.*, No. 85-6946, 1989 WL 205782, at *5, *7 (N.D. Cal. Nov. 30, 1989). Then, having lost on the issue, the defendant argued that verdict was advisory and requested a bench trial. *Id.* The district court disagreed because, while the defendant "did initially object to the jury determining the ultimate legal conclusion of inequitable conduct . . . when given its last opportunity to object to the jury instructions and special verdict forms at the final conference on jury

instructions . . . [defendant] did not object to the actual submission of inequitable

conduct to the jury." *Id.* On appeal, this Court affirmed, explaining that, the

defendant's "failure to object precludes it under Rule 51, Fed. R. Civ. P., from now

challenging the jury instructions, both ***as to their submission of the ultimate***

question of inequitable conduct to the jury and as to their content . . . ." 917 F.2d

at 542 (emphasis added).

Similarly, in *Bereda*, the Third Circuit reversed the district court's

determination that "where a jury is impaneled despite the absence of a right to a

jury trial, its verdict is 'in effect' advisory." *Bereda v. Pickering Creek Indus.*

Park, *Inc.*, No. 86-7236, 1988 WL 15200, at *2 (E.D. Pa. Feb. 23, 1988). The

Third Circuit explained that "the subject of an advisory jury was never mentioned

at any time during the proceedings." 865 F.2d at 52. Therefore, the jury's verdict

was binding by implicit consent. *Id*. at 52–53.

And in *Thompson*, after losing at trial, the defendant argued that it had

objected to an advisory jury by stating at a hearing before trial that "[I]f you

proceed on the equitable theory the jury . . . wouldn't be binding here . . . ?" 963

F.2d at 889. The district court ruled in defendant's favor, finding the verdict on the

equitable issue to be advisory. *Id*. But the Sixth Circuit reversed, relying on

Bereda, and held that the defendant's alleged objection was insufficient because it

was a question "premised on a situation which did not arise." *Id*. Thus, the court

held the parties had consented under Rule 39(c)(2). *Id*. at 889–90.

B. The parties consented to a binding Rule 39(c)(2) jury verdict on the equitable issues

1. UEI consented to a binding jury verdict with full awareness of the option of an advisory verdict

Like the defendants in *Modine*, UEI, through its conduct and words,

explicitly consented to trying the equitable issues to the jury, resulting in a binding

jury verdict. At each juncture, UEI made conscious, deliberate decisions with

respect to whether and what parts of the case should proceed to trial before a

jury—and it articulated its positions on these issues repeatedly. The law is clear

that no matter how disappointed UEI may be now by the adverse jury verdict, it

cannot reverse course and make an after-the-fact request that the verdict be treated

as advisory.

Prior to trial, UEI filed numerous papers related to the conduct of the trial.

See supra, pp. 20–25. All of these filings assumed the jury's involvement in

deciding the equitable issues, and reflected UEI's careful consideration of how

each issue would be decided. For example, UEI proposed jury instructions and a

verdict form that included the equitable issues, and argued about the proper

wording of those instructions and that form. *Id*. (citing A23455–62, A22088,

A23547–64). UEI specifically objected to the jury deciding *res judicata*, but

agreed the jury would "decide URC's patent misuse defense":

> 24
> 25   ¹ UEI objects to *res judicata* being tried by the jury. It is solely a
> 26   determination for the Court. However, UEI submits this instruction in an effort
>   to provide the jury with context from which to decide URC's patent misuse
> 27   defense.

A23459 n.1.

The parties also jointly submitted a proposed pretrial order that debated

bifurcation of the equitable issues. *See supra*, p. 21 (citing A21845–48). While

Universal Remote flagged an advisory verdict as an alternative to UEI's

bifurcation request, *see* A21847:18–19, neither UEI nor Universal Remote

requested an advisory verdict or objected to the jury's verdict being binding.

UEI also had the opportunity to request an advisory verdict at the jury

instruction hearing on the eve of trial. *See supra*, p. 24. At no point during this

hearing did UEI object to having the jury make a binding decision on the equitable

issues. *See* A31586–94 (debating jury instructions for patent misuse, equitable

estoppel, and unclean hands). Universal Remote, in contrast, took advantage of

this hearing to request an advisory verdict on obviousness, to which UEI objected.

A31507:9–15. Neither the court nor UEI raised the possibility of using an

advisory jury on the equitable issues or otherwise. Thus, like the losing party in

Bereda, UEI never mentioned "the subject of an advisory jury . . . at any time during the proceedings." 865 F.2d at 52 n.2.

By filing a Rule 50(a) motion requesting judgment as a matter of law on the equitable issues, UEI's conduct during trial reflected its understanding that the equitable issues were being tried to a binding jury verdict. *See supra*, p. 25 (citing A24448–53). It is well settled that Rule 50 motions apply only to issues being submitted for a ***binding*** jury verdict. 9B Wright & Miller § 2523; *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 895 n.5 (Fed. Cir. 1984) (explaining that it would "make charades" of Rule 50 motions to suggest that a jury's verdict on the subject of the Rule 50 motion was advisory). UEI even argued at a hearing that if the district court were to "deny [UEI]'s motion and judgment as a matter of law on these two issues [i.e., laches and equitable estoppel], ***they ought to go to the jury***." *See supra*, p. 25 (citing A33355:7–9) (emphasis added). UEI's alternative request that the equitable issues be submitted to the jury if its motion were denied reflects the well-settled law in *Perkin-Elmer*. Because the court did not grant either party's JMOL motion, all of the equitable issues were sent to the jury, as UEI requested.

The consequence of UEI's unbroken silence throughout the proceedings, despite ample opportunity to request an advisory verdict, is that it consented to a

binding jury verdict under Rule 39(c)(2). *See supra*, p. 35; *Modine*, 917 F.2d at

542; *Bereda*, 865 F.2d at 52.

2. UEI's request for bifurcation of the equitable issues is irrelevant to whether the jury's verdict is advisory or binding

UEI's request to bifurcate the equitable issues prior to trial is irrelevant to

whether the jury's verdict on the equitable issues was advisory or binding, for

several reasons. First, UEI's request for bifurcation went to whether the district

court would hear the equitable issues in a *separate* proceeding, away from the jury.

See Fed. R. Civ. P. 42(b) (". . . the court may order a separate trial of one or more

separate issues . . .."); 9A Wright & Miller § 2387; Fed. R. Civ. P. 39(b). It did not

relate to whether, if the jury heard the equitable issues, the jury would issue an

advisory verdict or a binding verdict.

Second, no bifurcation ever occurred because UEI never renewed its request

for bifurcation, as directed by the district court. *See supra*, pp. 22–23. UEI

therefore waived its bifurcation request. *See*, *e.g.*, *Williamson v. United States*, 310

F.2d 192, 197 (9th Cir. 1962) (finding waiver of a severance motion). Instead, all

of the equitable issues were submitted to the jury by consent of the parties. When

UEI decided not to renew its bifurcation request, that request "became irrelevant

. . . since the circumstance upon which the" request "had been founded did not

eventuate." *See Thompson*, 963 F.2d at 889 (explaining that pretrial exchanges

based on hypothetical scenarios are irrelevant if the circumstance on which the exchange is based does not occur).

Third, UEI's bifurcation motion specifically identified the problem UEI was concerned about: "Non-bifurcation has the potential to unduly influence the jury's decision with respect to the issue of infringement of the '906 patent. Bifurcation will eliminate this problem." A21846:26–21847:2. In other words, UEI's concern was not with the jury issuing a binding decision on the equitable issues, but with the prejudice to UEI's position on the legal issues that would allegedly be caused by having the jury *hear the facts* related to the equitable issues. However, without bifurcation, the jury would hear the facts regardless of whether its verdict was advisory or binding. Thus, UEI's initial, and later abandoned, request for bifurcation had nothing to do with whether the verdict would be binding or advisory.

Once the district court denied UEI's request for bifurcation (without prejudice to being renewed later), from that point forward UEI pursued a binding jury verdict. *See supra*, pp. 20–27. UEI apparently calculated that if the jury was going to hear the evidence on the equitable issues anyway, then it would be better to have the hometown jury decide those issues, rather than a judge who had already ruled that Universal Remote's equitable arguments had sufficient merit to avoid summary judgment and thus warrant a trial. *See infra*, p. 46.

Despite UEI's conduct, the district court reasoned, after trial, that the bifurcation request indicated UEI "clearly opposed" the jury "decid[ing] all issues." A6. But if that were true, UEI would have renewed its request for bifurcation or requested an advisory verdict. UEI made the strategic choice to do neither.

C.   The district court erred in retroactively deeming the jury's verdict advisory

No case has permitted what the district court did here—deem a jury verdict advisory under Rule 39(c)(1) *after* the jury has returned its verdict. In the Ninth Circuit, a verdict cannot be deemed advisory after trial begins because "parties are entitled to know at the outset of the trial whether the decision will be made by the judge or the jury." *Pradier v. Elespuru*, 641 F.2d 808, 811 (9th Cir. 1981); *see also Fuller v. City of Oakland*, 47 F.3d 1522, 1532–33 (9th Cir. 1995) (similar). The Third Circuit has implemented a similarly strict rule:

> Because considerations of fairness to the litigants indicate that Rule 39(c) should not be interpreted to allow a district judge to rule a jury verdict advisory after the parties have begun to implement their trial plan, we hold that when the litigants have consented to a nonadvisory jury under Rule 39(c), a district court must notify both sides of a jury's advisory status no later than the time at which the jury selection has begun.

Bereda, 865 F.2d at 53.

At least two appellate courts have addressed this unusual fact pattern, where a district court deemed a jury's verdict advisory after it issued, and both reversed

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and held that the jury's verdict was binding under Rule 39(c). *See Thompson*, 963

F.2d at 889; *Bereda*, 865 F.2d at 52–53. In *Thompson*, the Sixth Circuit held that

"the district court erred in determining that the verdict [on unjust enrichment]

would be advisory after the case was submitted to the jury. The parties are entitled

to know prior to trial whether the jury or the court will be the trier of fact." 963

F.2d at 889 (citing *Pradier*, 641 F.2d at 811). The Sixth Circuit emphasized that

the pretrial order stated that trial would be to a jury, and under Rule 16 that order

governs unless modified by a subsequent order: "No such subsequent order was

ever entered, verbally or otherwise, altering the jury trial stipulation." *Id.*

In *Bereda*, the Third Circuit held that "[t]he district court violated Rule 39(c)

. . . when it ruled that the jury was advisory after the verdict had been returned."

865 F.2d at 53. The Third Circuit recognized that a judge may empanel an

advisory jury even though the parties would prefer a non-advisory jury, but held

that in such a situation "a district court must notify both sides of a jury's advisory

status no later than the time at which the jury selection has begun." *Id.* The Third

Circuit reasoned that otherwise "[a]ll jury verdicts in cases not triable by right by a

jury would effectively be advisory, as the district judge could always rule that the

verdict was advisory if the judge did not agree with the jury's verdict," which

would be contrary to the "only reasonable construction" of Rule 39(c). *Id.* at 52.

Here, as in *Thompson*, the district court issued a Rule 16 order at the start of

the case that called for a jury trial. *See supra*, p. 19 (citing A2088, A2089:17).

Rule 16 provides in relevant part:

> (d) Pretrial Orders. After any conference under this rule, the court
> should issue an order reciting the action taken. ***This order controls the
> course of the action unless the court modifies it.***

Fed. R. Civ. P. 16(d) (emphasis added). Although the trial date in the Rule 16

order was later changed, the provision calling for a "Jury Trial" was not. Indeed,

in the over two years of litigation leading up to the jury's verdict, the court never

mentioned the issue. Thus, the original order calling for a "Jury Trial" continued

to govern. *See id.*; A2089; A2090–94.; *see also* 6A Wright & Miller § 1522

("[T]he pretrial order is treated as superseding the pleadings and establishing the

issues to be considered at trial."). The Rule 16 order was silent as to whether the

jury's verdict would be binding or advisory on the equitable issues, and the rule in

this situation is that the jury's verdict will be binding absent objection. *See*

Modine, 917 F.2d at 542 n.2; *Bereda*, 865 F.2d at 52–53; *Thompson*, 963 F.2d at

887–89.

The district court erred when it reasoned after trial that the "status quo, if

nothing else is said or done, is that the legal issues go to the jury and equitable

issues go to the court." *See supra*, p. 27 (citing A33544:19–33545:9). The district

court reasoned that it "intended to, and did, exercise its discretion to retain the

-45-

equitable issues for its own determination." A7. But the record does not reflect

this intent.[5] The district court and UEI did not identify a single instance where the

court *informed the parties*—as required by *Pradier*, 641 F.2d at 811—of such an

intent *prior* to trial. Even during trial, nowhere in the over 2,000 pages of trial

transcript preceeding the verdict did the district court make any reference to an

advisory verdict on the equitable issues. It was only on page 2,040, after the jury

returned its verdict, that the district court asserted—without any prompting or

context—"[i]n light of this verdict, to the extent there were equitable issues, we all

know those were advisory." A33529:15–17. But by then it was too late, because

not only had the trial begun, it had also concluded.

D.   UEI made the strategic decision to have a hometown jury decide the equitable issues rather than the district court

It was no accident that UEI waived bifurcation in favor of a binding jury

verdict. Prior to trial, when UEI was faced with whether to request an advisory or

binding verdict on the equitable issues, UEI reasonably could have expected that it

would have a friendly jury. UEI's headquarters are in Santa Ana, only a few miles

from the courthouse, *see* A31685:6–7, A31770:19–21, and thus it had a hometown

jury. Indeed, UEI played up this fact at trial. *See*, *e.g.,* A31784:3–10 ("Let me

---

[5] The court made several passing references to itself as a "trier of fact" on the second day of trial, *see supra*, p. 23, but those statements merely reflect UEI's bifurcation option—which UEI chose not to exercise. *See supra*, p. 20.

introduce you to UEI. . . . It's headquartered not too far from here. It has 175 employees."), A31794:12–13 ("As I said earlier today, UEI had a humble start out of a garage in Orange County . . . ."), A33505:15–16 ("We innovate. We create jobs. We hire people. We provide jobs that people feel good about, ...").

The district court, on the other hand, had issued a number of rulings against UEI that had reduced its case from four patents down to one. *See*, *e.g.,* A16813:21–23. The court had also ruled that Universal Remote's equitable defenses had sufficient merit to warrant a trial. *See* A16596:19–16600:27. And the court had stricken significant portions of UEI's expert reports, including UEI's request for reasonable royalty damages. *See* A21977–99. Finally, UEI knew that the court was aware of its litigation misconduct, assertion of meritless patents, and improper motivations for filing suit. A21–36. Indeed, the court subsequently awarded attorneys' fees to Universal Remote under 35 U.S.C. § 285 on those grounds. *Id*.

> But the district court reasoned to the contrary:
>
> Context here is important: all of the equitable issues were potential negatives for the Plaintiff. There was no possible upside for the Plaintiff in having the jury hear the relevant facts, which related to accusations of unclean hands and the like.

A6. The district court's reasoning is illogical—the jury would have heard (and did hear) all of "the relevant facts" regardless of whether the verdict was advisory or

binding. The only way for UEI to avoid having the jury hear "the relevant facts"

was to renew its request for bifurcation (which it chose not to do).

E.   The district court's unspoken intent cannot control

The district court evidently formed an intent at some point to utilize an

advisory jury verdict on the equitable issues. *See* A7 ("[T]he Court intended to,

and did, exercise its discretion to retain the equitable issues for its own

determination."). The district court had the discretion to order an advisory verdict.

See Fed. R. Civ. P. 39(c). But the Ninth Circuit requires district courts to exercise

that discretion ***before*** trial begins. *See supra*, p. 43 (citing *Pradier*). There are

sound reasons for this "bright-line rule," as the Ninth Circuit recognized in a

similar context:

> If a jury demand can be unilaterally withdrawn after trial begins, a
> party . . . would have the chance to see how its case goes and what the
> demeanor of the trial judge is and, if favorable, to then unilaterally
> waive its demand in light of the improved odds. This unsupportable
> result is akin to allowing a gambler to switch his bet as the horses
> reach the home stretch.

Fuller, 47 F.3d at 1532.

Similarly, as this case illustrates, the failure to enforce a bright-line rule

encourages collateral litigation over whether a jury's verdict was advisory or

binding, along with gamesmanship as parties switch horses as trial proceeds.

Moreover, allowing the unexpressed intent of the district court to trump the

written record would frustrate the purposes of Rule 16. Under Rule 16, "[p]arties

are entitled to rely on the scope of the jury trial described in the pretrial order." *Duhn Oil Tool, Inc. v. Cooper Cameron Corp.*, 818 F. Supp. 2d 1193, 1207 (E.D. Cal. 2011). "One major purpose of [a Rule 16] order is to eliminate surprise by sharpening and simplifying the issues which must be tried." *Walker v. W. Coast Fast Freight, Inc.*, 233 F.2d 939, 941 (9th Cir. 1956). "The preparation of a pretrial order requires careful attention and review by the parties and their attorneys." *Wilson v. Muckala*, 303 F.3d 1207, 1215 (10th Cir. 2002) (reversing a determination on a claim that was not included in an ambiguous Rule 16 order). The district court's after-the-fact declaration of its intent undermines these important policies.

<div align="center">* * * * *</div>

For the foregoing reasons, the jury's verdict on the equitable issues should be reinstated.

III.   The District Court Erred In Not Following The Jury's Implicit Factual Determinations

Even if the jury's verdict on the equitable issues was somehow advisory, the district court's findings with respect to patent misuse and unclean hands should nonetheless be reversed. By failing to follow the factual findings the jury made when it issued verdicts on the intertwined legal issues, the district court violated the Seventh Amendment.

The Seventh Amendment provides:

> In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and ***no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.***

U.S. Const. amend. VII (emphasis added).

Where the facts relevant to a jury's verdict on legal issues are intertwined with the facts relevant to equitable issues, the Seventh Amendment requires the district court to follow the implicit and explicit factual determinations underlying the jury's verdict on the legal issues. *See Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012) ("[T]he district court was required to accept all implicit factual findings supporting the jury's conclusion with respect to the ultimate conclusion of obviousness that were supported by substantial evidence."); *Therma-Tru Corp. v. Peachtree Doors Inc.*, 44 F.3d 988, 994 (Fed. Cir. 1995) ("[T]he court may not make findings in conflict with those of the jury."); *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 895 (Fed. Cir. 1984) ("[T]he appropriate question [is] can the jury's presumed findings support [the] conclusion of nonobviousness encompassed in the jury's verdict of validity?"); *L.A. Police Protective League v. Gates*, 995 F.2d 1469, 1473 (9th Cir. 1993) (holding the district court erred, when resolving equitable issues, in engaging in fact finding contrary to the implicit findings of the jury verdict on legal issues).

In *Kinetic Concepts*, the jury determined that the asserted claims of the

patents were not invalid for obviousness. 688 F.3d at 1346. The district court

granted defendant's motion for judgment as a matter of law and concluded the

asserted claims were obvious, and plaintiff appealed. *Id.* This Court explained

that because "obviousness is a mixed question of law and fact," this Court must

"presume that the jury resolved the underlying factual disputes in favor of the

verdict . . . ." *Id*. at 1356–57. Thus, this Court analyzed the jury's explicit and

implicit factual findings. *Id*. at 1360–68. For example, on the factual question of

the level of skill in the art, the parties presented competing factual scenarios—the

plaintiff asserted the level of skill in the art was higher than defendant had asserted.

Id. at 1366. This Court held that because the jury had found the patents not

obvious, and it is harder to find obviousness with a lower level of skill in the art,

the jury must be presumed to have found as a fact that the level of skill in the art

was the lower level proposed by the defendant. *Id*. In other words, where the

jury's finding on a particular question of fact was implicit in its verdict, rather than

explicit, this Court has held that the jury will be presumed to have found the facts

in the manner most conducive to reaching that verdict.

Here, the jury issued a binding verdict on the legal issue of improper

inventorship. A1504 (finding "URC has proven by clear and convincing evidence

that the '426 patent is invalid for improper inventorship"). Because the facts

relevant to improper inventorship are intertwined with the facts relevant to

Universal Remote's equitable defenses of patent misuse and unclean hands, the

district court should have followed the jury's findings in resolving the equitable

issues. Its failure to do so was reversible error.

A.   The district court failed to follow the implicit factual determinations of the jury that were relevant to patent misuse

In finding that Universal Remote proved improper inventorship of the '426

patent, the jury adopted the factual scenario presented by Universal Remote—a

scenario that involved UEI asserting the '426 patent in ***bad faith***, for an ***improper***

purpose, and while ***knowing*** it was invalid. Those factual determinations

underlying the verdict of improper inventorship are also directly relevant to the

equitable issue of patent misuse. Nonetheless, the district court disregarded the

jury's verdict and contradicted the underlying factual determinations when it

independently resolved the question of patent misuse.

1.   The jury's verdict on improper inventorship implicitly rested on a finding of improper motive

Because the jury found in favor of Universal Remote on the legal issue of

improper inventorship, "we must assume that, in light of the jury's verdict, it

adopted" the facts proposed by Universal Remote, and rejected the facts proposed

by UEI. *See Kinetic Concepts*, 688 F.3d at 1366.

Here, the factual scenario that Universal Remote presented, and supported

with testimony and documents, was that UEI falsely told the Patent Office that Mr.

Darbee was an inventor in order to "back date" the patent to try to avoid prior art

that Universal Remote had asserted. *See* A34257 (UEI "states that the omission of

Paul Darbee as inventor when the application was originally filed was not done

with any deceptive intention" (emphasis original)); A33157:7–9 ("The testimony

of Ms. Nguyen shows the statements that she and Mr. Hayes made in their petition

to correct inventorship in 2012 were false."); A33481:19–33485:22 (Universal

Remote closing argument regarding backdating); A24794–804 (Universal Remote

demonstratives showing backdating); *supra*, p. 11 (facts showing UEI knew, prior

to filing suit in 2012, that the prior art anticipated the '426 patent based on

Universal Remote's letter identifying the prior art and UEI's letter stating it could

change the inventorship to avoid the prior art, and UEI's subsequent dismissal of

the '426 patent with prejudice); *supra*, pp. 15–18 (facts showing UEI knew its

petition to correct inventorship lacked a good faith basis).

Universal Remote also presented evidence showing that UEI's efforts to

backdate the patent were a result of its improper motive of driving customers away

from Universal Remote and increasing Universal Remote's costs through patent

litigation. A36644 (email from UEI executive stating the lawsuit has "little value"

if not filed prior to customer meeting); A33451:19–33452:2 (closing argument);

see supra, p. 13 (facts related to UEI's improper motivations); *supra*, pp. 15–18

(facts showing UEI concealed the petition and obstructed discovery on improper

inventorship). Thus, when UEI rushed to file suit against Universal Remote prior

to an important meeting with Time Warner, UEI asserted the '426 patent—a patent

that it knew was invalid as anticipated. And worse, when UEI petitioned to add an

inventor, it filed a false declaration with the Patent Office. In filing that false

declaration, UEI attempted to claim that it had invented what it knew others had

invented, and forced Universal Remote to litigate improper inventorship all the

way through an expensive jury trial.

UEI, in contrast, argued that it was simply a mistake that Mr. Darbee was

not included as an inventor in the original '426 patent application. A33158:2–5.

But the jury disagreed and found improper inventorship. A1504. Indeed, the

district court found UEI lacked credibility on the inventorship issue. *See* A11;

supra, p. 17.

In sum, the jury's verdict on improper inventorship shows that it adopted the

facts proved by Universal Remote—including the important facts that (1) UEI

knew the '426 patent was invalid as anticipated when it filed this lawsuit; (2) UEI

asserted an anticipated patent for the improper purpose of driving customers away

from Universal Remote; (3) UEI improperly submitted a false petition to correct

inventorship; (4) UEI added a false inventor for the improper purpose of harming

Universal Remote with expensive patent litigation; and (5) UEI added a false

inventor for the improper purpose of attempting to claim UEI had invented what

others had actually invented.

2.   The district court's finding to the contrary violated the Seventh Amendment

The district court found, contrary to the facts supporting the jury's verdict on

improper inventorship, that UEI's assertion of the '426 patent was not patent

misuse. A17. The patent misuse jury instruction, which specifically incorporates

the improper inventorship issue, provided, in relevant part:

> URC alleges that UEI misused the '426 patent by: 1) asserting the '426 patent allegedly ***knowing it was invalid for naming an incorrect inventor*** . . . .

> In order to find patent misuse in this case, you must determine whether UEI brought objectively baseless claims of infringement for the '426 patent against URC in ***bad faith*** and for an ***improper purpose***. A purpose is improper if its goal is not to win a favorable judgment, but to harass a competitor and deter others from competition by engaging the litigation process itself. . . .

A1544 (emphases added).

The district court reasoned that Universal Remote did not prove an

"improper purpose" because Universal Remote did not prove that UEI "believed"

UEI was asserting an invalid patent. A17. And, it reasoned that Universal Remote

did not prove "bad faith" because it "did not establish that [UEI] knew that the

patent was invalid." *Id*. Notably, the district court's analysis of patent misuse

omitted any mention of the "bad faith" that UEI demonstrated when it filed a false

-55-

petition to correct inventorship in an effort to burden Universal Remote with expensive patent litigation. *See* A16–17.

But, as explained above, the jury found the facts relevant to patent misuse when it issued its verdict on the legal issue of improper inventorship. *See*, *e.g.*, *Kinetic Concepts*, 688 F.3d at 1366. By asserting the '426 patent, UEI used "objectively baseless claims of infringement" in "the litigation process" to "harass a competitor." *See* A1544. Similarly, UEI's false petition to correct inventorship reflected its "improper purpose" of improperly circumventing prior art and harassing Universal Remote. And finally, UEI knew the '426 patent was invalid, as reflected by the facts and circumstances surrounding its decision to dismiss the '426 patent with prejudice from the 2000 litigation.

The patent misuse jury instruction specifically incorporated by reference improper inventorship. The jury found improper inventorship, yet the district court rejected the implicit factual findings supporting the jury's verdict. In doing so, the district court violated the Seventh Amendment.

> **B.   The district court failed to follow the implicit factual determinations of the jury that were relevant to unclean hands**

The district court also failed to follow the jury's implicit factual determinations relevant to unclean hands. The jury instruction on unclean hands provided:

The owner of a patent may be barred from enforcing the patent against an infringer where the owner of the patent acts or ***acted inequitably, unfairly, or deceitfully towards the infringer*** or the Court in a way that has immediate and necessary relation to the relief that the patent holder seeks in a lawsuit. This is referred to as "unclean hands," and it is a defense that URC contends precludes any recovery by UEI in this lawsuit.

You must consider and weigh ***all the facts and circumstances*** to determine whether you believe that, on balance, UEI acted in such an unfair way towards URC or the Court in the matters relating to the controversy between UEI and URC that, in fairness, UEI should be denied the relief it seeks in this lawsuit. URC must prove unclean hands by a preponderance of the evidence.

A1551 (emphases added).

The fact that UEI knowingly asserted an invalid patent in bad faith and for an improper purpose, as the jury found in deciding that inventorship was improper, goes to the heart of any determination of whether UEI "acted inequitably, unfairly, or deceitfully towards" Universal Remote and is a crucial part of the relevant "facts and circumstances." In rejecting Universal Remote's unclean hands claim, the district court failed to follow the findings of fact implicit in the jury's verdict on the legal issue of improper inventorship, and in so doing violated Universal Remote's Seventh Amendment right to a jury.

<p style="text-align:center">*   *   *   *   *</p>

For all of these reasons, the district court's findings of no patent misuse and no unclean hands should be reversed in light of the jury's implicit factual findings with respect to improper inventorship.

CONCLUSION

The jury's verdicts of laches, equitable estoppel, patent misuse, and unclean hands should be reinstated.

Dated: June 19, 2015

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PROOF OF SERVICE

I HEREBY CERTIFY that on the date and in the place shown below, I

served the foregoing documents on the persons listed below in the manner

indicated below.

Person(s) served	Manner of service
Mark A. Finkelstein Gregory A. Castanias Sheryl H. Love Thomas R. Goots	By the Court's CM/ECF system

I declare under penalty of perjury under the laws of the United States of

America that the foregoing is true and correct. Executed on June 19, 2015.

By: /s/ Peter H. Kang

CERTIFICATE OF COMPLIANCE

1.   This brief complies with the type-volume limitation of Federal Rule of Appellate Procedure 32(a)(7)(B) because according to the word count function of the word-processing program used to prepare the brief, the brief contains 13,646 words, excluding the parts of the brief exempted by Federal Rule of Appellate Procedure 32(a)(7)(B)(iii) and Federal Circuit Rule 32(b).

2.   This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6) because the brief has been prepared in a proportionally spaced typeface using Microsoft Word 2007 in 14-point Times New Roman font.

Dated: June 19, 2015   By: /s/ Peter H. Kang

ADDENDUM

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8   UNITED STATES DISTRICT COURT

9   CENTRAL DISTRICT OF CALIFORNIA

10   SOUTHERN DIVISION

11   )   No. 8:12-cv-00329-AG-JPR
    Universal Electronics Inc.,   )
12   )
            Plaintiff and   )
13   *Counterclaim-Defendant*,   )   **FINAL JUDGMENT**
)
14   vs.   )
)
15   Universal Remote Control, Inc.,   )
)
16   *Defendant and*   )
            Counterclaimant.   )
17   )

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FINAL JUDGMENT

This action was tried by a jury with Judge Guilford presiding, and the jury has rendered a verdict. In accordance with the jury's verdict and rulings by the Court, it is ordered that:

1.   Plaintiff Universal Electronics Inc. shall recover nothing on its claims of patent infringement against Defendant Universal Remote Control, Inc.

2.   Claims 4–16 of U.S. Patent No. 5,568,367 are invalid.

3.   Claims 1, 10, and 12 of U.S. Patent No. 5,614,906 are not infringed by Defendant Universal Remote Control, Inc.

4.   Claims 1, 10, 12, and 16 of U.S. Patent No. 5,614,906 are invalid.

5.   Claims 2 and 3 of U.S. Patent No. 5,414,426 are not infringed by Defendant Universal Remote Control, Inc.

6.   All claims of U.S. Patent No. 5,414,426 are invalid.

7.   Plaintiff Universal Electronics Inc. has failed to comply with the marking provisions of 35 U.S.C. § 287(a) with respect to U.S. Patent No. 5,414,426.

8.   Plaintiff Universal Electronics Inc. has failed to comply with the marking provisions of 35 U.S.C. § 287(a) with respect to U.S. Patent No. 6,587,067.

9.   Plaintiff Universal Electronics Inc.'s claim against Defendant Universal Remote Control, Inc. for infringement of U.S. Patent No. 5,414,426 is barred by laches.

10.   Defendant Universal Remote Control, Inc. shall recover its costs from Plaintiff Universal Electronics Inc.

11.   This is a final judgment and is appealable.

JUDGMENT IS SO ENTERED.

Dated: 1/27/2015

_____
ANDREW J. GUILFORD
United States District Court Judge

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	SACV 12-00329 AG (JPRx)	Date	December 16, 2014
Title	UNIVERSAL ELECTRONICS, INC. v. UNIVERSAL REMOTE CONTROL, INC.		

Present: The Honorable	ANDREW J. GUILFORD	

Lisa Bredahl	Not Present	
Deputy Clerk	Court Reporter / Recorder	Tape No.

Attorneys Present for Plaintiffs:	Attorneys Present for Defendants:

Proceedings: **[IN CHAMBERS] FINDINGS OF FACT AND CONCLUSIONS OF LAW ON EQUITABLE ISSUES**

INTRODUCTION

After a jury trial, the parties filed briefs concerning the resolution of Defendant's equitable defenses. (Dkt. Nos. 413, 414, 415, and 424.) The parties dispute not only the substance of those issues, but also whether they were submitted to the jury for final decision or an advisory verdict.

The Court heard the trial and knows what happened. Throughout the trial, numerous references were made concerning the Court being a "partial trier of fact," and the Court itself made this exact statement. No objection was made, and this was the common understanding. The jury's verdict on the equitable issues was advisory. The Court holds that Plaintiff's claim for infringement of the '426 Patent is barred by laches, but not by equitable estoppel or patent misuse. The Court holds that neither parties' claims or defenses are barred by unclean hands.

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	SACV 12-00329 AG (JPRx)	Date	December 16, 2014
Title	UNIVERSAL ELECTRONICS, INC. v. UNIVERSAL REMOTE CONTROL, INC.		

ANALYSIS

1. THE JURY'S VERDICT ON THE EQUITABLE DEFENSES

1.1   Legal Standard

Equitable issues are tried by the Court, with or without an advisory jury, unless the parties consent, and the Court agrees, to the jury finally deciding the equitable issues:

> (c) Advisory Jury; Jury Trial by Consent. In an action not triable of right by a jury, the court, on motion or on its own:
>
> > (1) may try any issue with an advisory jury; or
> >
> > (2) may, with the parties' consent, try any issue by a jury whose verdict has the same effect as if a jury trial had been a matter of right, unless the action is against the United States and a federal statute provides for a nonjury trial.

Fed. R. Civ. P. 39.

> In an action tried on the facts without a jury or with an advisory jury, the court must find the facts specially and state its conclusions of law separately. The findings and conclusions may be stated on the record after the close of the evidence or may appear in an opinion or a memorandum of decision filed by the court.

Fed. R. Civ. P. 52(a)(1).

A000004

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	SACV 12-00329 AG (JPRx)	Date	December 16, 2014
Title	UNIVERSAL ELECTRONICS, INC. v. UNIVERSAL REMOTE CONTROL, INC.		

1.2   Application

Defendant argues that the equitable issues were submitted to the jury for binding decision. Defendant relies on the parties' demand for a jury trial in their pleadings and the Court's setting a jury trial in the Rule 16 scheduling order. (Def.'s Opening Br., Dkt. No. 414 at 2.) That argument ignores Fed. R. Civ. P 39(a), which provides:

> When a jury trial has been demanded under Rule 38, the action must be designated on the docket as a jury action. The trial on all issues so demanded must be by jury unless:
>
> (1) the parties or their attorneys file a stipulation to a nonjury trial or so stipulate on the record; or
>
> (2) the court, on motion or on its own, finds that on some or all of those issues there is no federal right to a jury trial.

Thus, even if the parties had demanded a jury trial on the equitable issues, the Court would have found that there was no federal right to a jury trial on them. And, as Plaintiff points out, the parties' pleadings only called for a jury for all issues "so triable" or "properly tried to a jury." (Pl.'s Reply, Dkt. No. 415 at 2.) Further, the scheduling order cited by Defendant was merely noting that at least a portion of the case would require a jury.

Defendant relies on *Modine Mfg. Co. v. Allen Group, Inc.*, 917 F.2d 538 (Fed. Cir. 1990), where the losing party to an inequitable conduct jury verdict argued that the issue should not have gone to the jury. In holding that the issue had been properly submitted to the jury for decision, the Federal Circuit held: "We simply do not believe the three earlier instances in which Allen claims to have made the trial court generally aware of its position constituted the sort of pattern of specific objection throughout the course of the trial, including the jury instruction phase, that was present in [prior cases finding no waiver]." *Id.* at 542. And when it was before the trial court, the losing party in *Modine* "did initially object to the jury determining the ultimate legal conclusion of inequitable conduct, [but later] conceded that

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

CIVIL MINUTES - GENERAL

Case No.	SACV 12-00329 AG (JPRx)	Date	December 16, 2014
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the factual underpinnings must be decided by the jury." *Modine Mfg. Co. v. Allen Grp., Inc.*, C-85-6946-DLJ, 1989 WL 205782 at *7 (N.D. Cal. Nov. 30, 1989) *aff'd*, 917 F.2d 538 (Fed. Cir. 1990).

Modine does not govern the very different circumstances of this case. Defendant points to the proposed final pretrial order in which Plaintiff asked the Court to bifurcate the equitable issues, while Defendant's preference was for a unified trial. (Def.'s Op. Br. 3.) In denying the request for bifurcation, the Court stated : "the papers kind of look like [Plaintiff was] using bifurcation to grab an extra four days for our eight-day trial. Bifurcation will not be a vehicle to extend the eight days." (April 21, 2014 Motion Hearing Tr. 22:19-23.) Thus, the Court did not state that the jury would decide all issues, and Plaintiff clearly opposed the jury doing so.

Context here is important: all of the equitable issues were potential negatives for the Plaintiff. There was no possible upside for the Plaintiff in having the jury hear the relevant facts, which related to accusations of unclean hands and the like. Defendant's portion of the proposed pretrial order opposing bifurcation stated:

> Although URC does not disagree that the defense is equitable in nature, UEI's argument overlooks the fact that issues related to UEI's unclean hands defense are also part of URC's counterclaim for invalidity of the '426 patent. For example, the evidence concerning UEI's troubling ten year delay in petitioning to correct inventorship relates to both patent invalidity and to UEI's unclean hands in bringing this suit. This evidence is properly heard **first** by the jury. *See Beacon Theat[re]s, Inc. v. Westover*, 359 U.S. 500, 508 (1959). **The Court may in its discretion seek an advisory verdict from the jury after the evidence of unclean hands is presented**.

(Proposed Final Pretrial Conference Order, Dkt. 309-1 16 (emphasis added).) As Defendant notes, the Court could not decide to treat a jury's verdict as advisory if the issue had been submitted to the jury for final determination. So Defendant could not have been proposing that the Court could decide mid-trial to take the issue away from the jury and change the

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jury's role to an advisory one. Instead, Defendant's submission conveyed that the equitable issue was for the Court to decide, but if the Court wanted the jury's advice, it could ask for it.

Another difference between this case and *Modine* is that there, the Court intended to submit the issue to the jury for final decision. *Modine Mfg. Co.,* 1989 WL 205782 at *7. Here, the Court did not. Instead, the Court intended to, and did, exercise its discretion to retain equitable issues for its own determination.

> Rule 39(c) provides that the court, "with the consent of both parties, *may* order a trial with a jury whose verdict has the same effect as if trial by jury had been a matter of right." Fed.R.Civ.P. 39(c) (emphasis added). Thus, when both parties consent, Rule 39(c) invests the trial court with the discretion—but not the duty—to submit an equitable claim to the jury for a binding verdict. While the litigants are free to request a jury trial on an equitable claim, they cannot impose such a trial on an unwilling court.

Merex A.G. v. Fairchild Weston Sys., Inc., 29 F.3d 821, 827 (2d Cir. 1994). The Court here did not exercise its discretion to submit the equitable claim to the jury for a binding verdict. Instead, very significantly, the Court, during the trial, reminded the parties that they were "partly trying this case to this Court" and referred to the Court both "as a partial trial of fact" and "the trier of fact [on some issues]." (Tr. 390:13-391:10, 400:23-24.)

Another case Defendant relies upon, *Duhn Oil Tool, Inc. v. Cooper Cameron Corp.*, 818 F. Supp. 2d 1193 (E.D. Cal. 2011), also does not support its position. There, the parties previously waived a jury on certain **legal** claims, but before trial the Court ordered that all legal claims would be tried to the jury, and the jury would be advisory on other issues. In confirming its understanding of the pretrial order, the Court noted that the "parties' course of conduct establish its meaning beyond the shadow of a doubt." *Id.* at 1207.

Here too, the parties' conduct clearly establishes that everyone understood that the jury would be advisory on the equitable issues. At the close of the trial, the Court, very significantly, stated: "I need to sort out what the equitable issues are that we've occasionally

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talked about. In light of this verdict, to the extent there were equitable issues, we all know those were advisory." (Tr. 2040:12-18.) The Court then ordered the parties to confer regarding post-trial motions, including on the advisory equitable issues in the verdict. (Tr. 2040:12-18.) Defendant made no objection at that time.

The parties then filed a stipulation, quoting those statements from the Court and proposing "that the Court reserve entry of judgment on all issues until the parties have briefed which issues were equitable and if so how the Court should resolve those issues." (Dkt. 398 2.) There is no hint in that stipulation, filed a week after trial, that Defendant had by then even conceived of the argument that the jury verdict on the equitable issues was binding. Defendant says that it "edited the post-trial stipulation to remove all references to findings of fact under Rule 52(a)(1) so that the stipulation would be 'neutral' on whether the verdict was binding or merely advisory . . . ." (Def.'s Reply 4.) But the email from Defendant's counsel accompanying the revision stated: "I changed the language to make it neutral about which issues may or may not be equitable." (Def.'s Reply Ex. BB.) This is consistent with the redline Defendant's counsel sent, which struck the identification of "patent misuse, laches, equitable estoppel, res judicata, and unclean hands" as the equitable issues and replaced it with language stating that the briefs would address "which issues were equitable." (Def.'s Reply Ex. CC.)

Surely, if Defendant had the argument it now urges in mind, it would have clearly raised it in response to the Court's remarks, or at the very latest, in drafting the stipulation. Defendant's reputable counsel would not have deliberately attempted to sandbag Plaintiff, who, consistent with the Court's understanding, devoted its brief (the first in the agreed schedule) to the substantive issues, with zero discussion of the issue of whether the jury's verdict was advisory. This course of conduct further reinforces the Court's conclusion that all parties understood at the time of trial that the jury's verdict on equitable issues was advisory.

The most powerful evidence pointing in the opposite direction is Plaintiff's filing of a Rule 50(a) Motion during trial that addressed misuse and unclean hands. (Dkt. No. 389.) The Court does not view the filing of the Rule 50(a) Motion in the middle of an active trial as an indication of Plaintiff's view on whether the jury's verdict was advisory. Further, Plaintiff

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has represented to the Court that it always contemplated that equitable arguments would be made after the jury was dismissed. (Tr. of Hr'g re Equitable Issues, Dkt. 428 32:8-11.) And Defendant "thought that [Plaintiff was] going to seek bifurcation during the trial." (Tr. of Hr'g re Equitable Issues, Dkt. 428 33:1-9.) While Plaintiff did not seek formal bifurcation, such bifurcation would only have governed how the evidence would be presented, not who would make the decision. Bifurcation was understood to mean presenting evidence on equitable issues outside the jury's presence. That is consistent with the Court's understanding at the outset of trial that the equitable issues were not going to be submitted to the jury for binding decision. Thus, while the issue could have been clarified by the parties, the Court is satisfied that the parties "kn[e]w at the outset of the trial whether the decision will be made by the judge or the jury." *Pradier v. Elespuru*, 641 F.2d 808, 811 (9th Cir. 1981).

The Court will therefore decide the equitable issues under Fed. R. Civ. P. 52(a)(1), and issues findings of fact and conclusions of law in Sections 2 and 3. Conclusions of law in Section 2, Findings of Fact, are included in the Court's conclusions of law, and findings of fact in Section 3, Conclusions of Law, are included in the Court's findings of fact.

2. FINDINGS OF FACT

United States Patent No. 5,414,426 ("'426 Patent") issued on May 9, 1995. ('426 Patent, Title Page). Plaintiff was the original assignee. (*Id.*) United States Patent No. 6,587,067 ("'067 Patent") issued on July 1, 2003. ('067 Patent, Title Page.) Plaintiff was the original assignee. (*Id.*) During the prosecution of the '426 Patent, Paul Darbee was not named as an inventor, and the Patent Office specifically stated: "Paul Darbee is not one of the inventors for this application." (Ex. 2 at UEI000065, 71.)

Defendant began selling its MX-500 remote in March 2001 and continued to sell it for over 10 years. (Tr. 1591:25-1592:6.) Over time, Defendant added more brands to the code library in the MX-500, but did not change the functionality of the device. (Tr. 1641:20-1642:15, 1589:18-21.) At a deposition not made part of the trial record, Defendant's CEO, Park, testified that the rotating favorite channel macro—pressing a button multiple times to cycle through favorite channels, rather than having separate buttons for favorite channels—was

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first introduced in 2007. (Decl. of Brian Haan in Supp. of Pl.'s Opp'n to Def.'s Mot. for Summ. J., Dkt. No. 176, Ex. 10 454:19-456:19.) Because this testimony was not admitted at trial, the Court does not include it in its findings of fact.

In a prior case between the parties that Plaintiff filed on November 15, 2000 ("the prior case"), Plaintiff initially asserted the '426 Patent. (Ex. 178, ¶ 8.) In response, Defendant asserted that prior art invalidated the '426 Patent. (Ex. 1094 at URCI005380-81.) Plaintiff replied that it could add Darbee as an inventor to the '426 Patent, and in so doing, claim entitlement to a priority date before the relevant prior art. (Ex. 1095 at URCI005385.) But instead of adding Darbee as an inventor, Plaintiff dismissed all claims under the '426 Patent with prejudice, and did not include the '426 Patent when it filed its First Amended Complaint in the prior case on October 18, 2002. (Exs. 1089, 1090 at 3.)

Plaintiff was aware of the MX-500 product at the time of the prior case. (Tr. 541:6-10.) Indeed, Plaintiff accused the MX-500 product in its First Amended Complaint in the prior case, but had dropped the '426 Patent from the case at that time. (Ex. 1090.) In short, Plaintiff could have, but did not, accuse the MX-500 product of infringing the '426 Patent in the prior case. (Ex. 178, Tr. 1574:6-24.)

As a prelude to this case, Plaintiff sent letters to Defendant in 2010 and 2011 accusing it of infringement and inviting it to negotiate a resolution. (Exs. 561, 562.) Four weeks before Plaintiff filed this case, Plaintiff's Senior Vice-President, Lou Hughes, sent an email stating: "I NEED URC to be sued before this Time Warner RFQ comes out. If this does not happen then there is little value in it for us directly. We have about three to four weeks now to get this done MAX." (Ex. 1333.)

Plaintiff filed this case on March 2, 2012, asserting, among other patents and claims, claims 1, 2, 3, 4, 10, and 13 of the '426 Patent. (Ex. 90, ¶ 17.) Despite the lawsuit, Time Warner gave increased business to Defendant, not Plaintiff. (Tr. 139:5-13, 964:14-965:12.) On October 4, 2012, Plaintiff's Vice-President of Subscription Broadcast Sales, Steve Gutman, sent an email to Hughes about "sticking it to URC" and hoping that Defendant losing an account would "kill them." (Ex. 1358.) Hughes responded "AWESOME! We are going to get VERY

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aggressive on this quote [to another of Defendant's customers]. We are going to push URC's margin and price DOWN. That along with the current lawsuit should push them to the brink. This will be payback for Time Warner." (Ex. 1358.)

On July 3, 2012, after Plaintiff filed this case, Plaintiff petitioned the PTO to add Darbee as an inventor. (Ex. 21.) Neither Pat Hayes, who submitted the petition on behalf of Plaintiff, nor named inventor Kim Nguyen, who signed the petition, had any recollection as to what Darbee's inventive contribution was to the '426 Patent. The videotaped and live testimony of these two witnesses was damning. When testifying on this point, they appeared nervous or combative, and neither could provide any cogent explanation for the 10-year delay in seeking correction of inventorship. They had credibility issues.

On June 12, 2013, fifteen months into this lawsuit, Plaintiff accused the MX-500 of infringing all asserted claims of the '426 and '067 Patents. (Ex. 604 at 8:3-6, Tr. 1588:19-1589:17.) About three months later, on September 5, 2013, Plaintiff dropped its claim of infringement against the MX-500 product and any assertion of claim 1 of the '426 Patent. (Ex. 624 4.) Defendant did not show that the MX-500 product is essentially the same as the other remote controls accused of infringing '426 Patent claims 2 and 3.

No evidence was presented that Defendant would have changed its activity had Plaintiff sued it earlier. Defendant's CEO, Park, testified that Defendant stayed in the cable remote control business because its business partner, Ohsung Electronics, built a factory in Mexico to support Defendant's operation, so Park felt obligated to keep that factory running. (Tr. 1625:11-1626:25.) Defendant viewed the cable remote controls that are the subject of this litigation as commodity products that have remained static for the last 20 years, so Defendant has done very little, if any, research and development in that product category. (Tr. 701:7-702:4.)

No evidence was presented that this lawsuit has harmed Defendant in the marketplace. Nor was any there any proof of evidentiary prejudice. Defendant complains that "it is very difficult and time consuming to present admissible evidence from so long ago" (Def.'s Op. Br. 17), but Defendant put invalidating prior art before the jury.

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The parties' remote controls come pre-programmed with codes for controlling audiovisual appliances from multiple manufacturers. Defendant copied Plaintiff's list of codes, incorporating the false company names that Plaintiff includes in its code lists to detect such copying. (Tr. 479:3-183:13.)

3. CONCLUSIONS OF LAW

Of the equitable theories to be decided by the Court, all but unclean hands relate solely to the '426 Patent. The parties also discuss whether laches bars Plaintiff's assertion of the '067 Patent, but neither infringement nor validity of the '067 patent were addressed at trial, so the issue was moot, and no advisory question was put to the jury about laches for the '067 Patent.

The Court granted summary judgment before trial that Defendant did not infringe the '426 Patent. (Order on Defendant's Motion for Summ. J., Dkt. No. 222 29-31.) At trial, the jury decided that the '426 Patent was invalid for improper inventorship. (Verdict Form, Dkt. No. 408, Question No. 9.)

In ruling on the parties' proposed jury instructions, the Court decided the law governing these questions. Defendant expressly agrees, and Plaintiff does not dispute, that the jury instructions are law of the case. (Def.'s Opening Br. 10-11.)

3.1 Laches - '426 Patent

Final Jury Instruction No. 37 provided that to establish laches:

> URC must prove delay and prejudice by a preponderance of the evidence. . . .
> If suit was delayed for six years, a rebuttable presumption arises that the delay
> was unreasonable and unjustified, and that material prejudice resulted.

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> Prejudice to URC can be evidentiary or economic. Whether URC suffered evidentiary prejudice is a question that must be answered by evaluating whether delay in filing this case resulted in URC not being able to present a full and fair defense on the merits to UEI's infringement claim. . . . Economic prejudice is determined by whether or not URC changed its economic position in a significant way during the period of delay resulting in losses beyond merely paying for infringement (such as if URC could have switched to a noninfringing product if sued earlier), and also whether URC's losses as a result of that change in economic position likely would have been avoided if UEI had filed this lawsuit sooner.

(Dkt. No. 410 41-42.) The jury's advisory verdict was that Defendant proved by a preponderance of the evidence that Plaintiff's claim for infringement of the '426 Patent is barred by laches. (Verdict Form, Dkt. No. 408, Question No. 11.) Neither party ever proposed that the question should be asked on a product-by-product or claim-by-claim basis.

Plaintiff accused the MX-500 product in the prior case. It did not assert the '426 Patent against the MX-500 in the prior case, but it could have. And Defendant's CEO, Park, testified at trial that the functionality of the MX-500 did not change between the prior case and this case. Plaintiff now cites evidence that the product did, in fact, change in the intervening period, but again, Plaintiff did not introduce that evidence at trial.

Therefore, "suit was delayed for six years," so "a rebuttable presumption arises that the delay was unreasonable and unjustified, and that material prejudice resulted." (Dkt. No. 410, Jury Instruction No. 37.) Plaintiff did not rebut those presumptions at trial. First, Plaintiff did not justify its delay. Second, plaintiff did not rebut the presumption of prejudice. Consistent with Jury Instruction No. 37,

> [e]conomic prejudice may arise where a defendant and possibly others will suffer the loss of monetary investments or incur damages which likely would have been prevented by earlier suit. Such damages or monetary losses are not merely those attributable to a finding of liability for infringement. Economic

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prejudice would then arise in every suit. The courts must look for a change in the economic position of the alleged infringer during the period of delay. On the other hand, this does not mean that a patentee may intentionally lie silently in wait watching damages escalate . . . particularly where an infringer, if he had had notice, could have switched to a noninfringing product. Indeed, economic prejudice is not a simple concept but rather is likely to be a slippery issue to resolve.

A.C. Aukerman Co. v. R.L. Chaides Const. Co., 960 F.2d 1020, 1033 (Fed. Cir. 1992) (citations omitted).

Here, economic prejudice is indeed "a slippery issue to resolve." As discussed further in Section 3.2, the evidence at trial showed that Defendant would not necessarily have done anything differently if sued earlier. But it could have switched to a noninfringing product. And the long delay here raises the concern that Plaintiff "intentionally l[ay] sliently in wait watching damages escalate." *Id.*

Given the slippery standard and the lackluster facts, the best the Court can say is that Plaintiff did not rebut the presumption of material prejudice. Plaintiff certainly did not prove that anything would have stopped Defendant from switching to a noninfringing product.

The Court therefore holds that laches bars Plaintiff's enforcement of the '426 Patent.

3.2   Equitable Estoppel - '426 Patent

Final Jury Instruction No. 38 provided that equitable estoppel applies when:

(1) the patent holder communicates something in a misleading way to the infringing party about the lack of infringement or about not being sued, (2) the infringer relies upon the misleading communication from the patent holder, and (3) the infringer will be materially harmed if the patent holder is allowed to

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    assert a claim relating to the issue that is inconsistent with the patent holder's prior misleading communication.

(Dkt. No. 410 43.) The jury's advisory verdict was that Defendant proved by a preponderance of the evidence that Plaintiff's claim for infringement of the '426 Patent is barred by equitable estoppel. (Verdict Form, Dkt. 408, Question 12.)

The first and third prongs are met, but the second, reliance, is not. Reliance "is not a requirement of laches but is essential to equitable estoppel." *A.C. Aukerman*, 960 F.2d at 1042. Defendant notes the Court's previous finding that "the only possible inference is that Defendant was led to reasonably believe that Plaintiff did not intend to assert the '426 Patent." (Def.'s Opening Br. 17 (quoting Order on Defendant's Mot. for Summ. J., Dkt No. 222 12).) Defendant then argues: "[t]hat satisfies the first two prongs of equitable estoppel (misleading communication and reliance)." (Def.'s Opening Br. 17-18.)

But as made clear in the Court's summary judgment ruling, the fact that the only possible inference from an action is an intent not to assert a patent only addresses the first prong. (Order on Defendant's Mot. for Summ. J., Dkt No. 222 10-11.) Further, the "only possible inference" standard is only relevant to summary judgment. (*Id.*) So, Defendant needed to prove reliance. "Another significant difference from laches is that no presumption adheres to an equitable estoppel defense. Despite a six-year delay in suit being filed, a defendant must prove all of the factual elements of estoppel on which the discretionary power of the court rests." *A.C. Aukerman*, 960 F.2d at 1043.

The evidence at trial did not show that Defendant relied on Plaintiff's communicated intent to not assert the '426 Patent. There was no evidence presented of specific design alternatives that were foregone or any specific investment undertaken in reliance on Defendant's belief that the '426 Patent would not be asserted.

Defendant was not investing in research and development for commodity cable remote controls because it did not believe such investment was commercially beneficial. And Defendant continued in the low-margin commodity cable business instead of focusing on its

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preferred high-end business because it felt obligated to Ohsung, which built a factory in Mexico to meet Defendant's needs.

Defendant offers hypotheticals about what it might have done had Plaintiff sued earlier. (Def.'s Op. Br. 16.) It could have omitted accused features. It could have invalidated the patents earlier, "minimizing URC's exposure and cost of litigation." But Defendant did not show that it omitted any '426 Patent accused features after Plaintiff's 2010 and 2011 letters. And despite the eagerness Defendant now professes for invalidating the patent, it did not initiate a declaratory judgment suit in response to those letters. Instead, it kept doing what it was doing commercially, and took no legal action. In sum, Defendant has not shown reliance.

Therefore, the Court holds that equitable estoppel does not prevent the assertion of the '426 Patent.

3.3   Patent Misuse - '426 Patent

Final Jury Instruction No. 36 provided that to prove patent misuse, Defendant needed to show that:

> UEI brought objectively baseless claims of infringement for the '426 patent
> against URC in bad faith and for an improper purpose. A purpose is improper
> if its goal is not to win a favorable judgment, but to harass a competitor and
> deter others from competition by engaging the litigation process itself. You
> must presume that UEI's infringement suit was filed in good faith, and URC
> may only rebut that presumption with clear and convincing evidence.

(Dkt. No. 410 39.) The jury's advisory verdict was that Defendant proved by clear and convincing evidence that Plaintiff is barred from enforcing the '426 Patent against Defendant for patent misuse. (Verdict Form, Dkt. No. 408, Question 10.)

Evidence at trial showed that this suit was motivated at least in part by a desire to harm

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Defendant, a successful market competitor. But Defendant needs to show how the intended harm went beyond the consequences of the patent law's grant of an exclusive right. That is, patents are supposed to convey a competitive advantage, but they are not self-executing. Patentees often need to litigate to obtain the benefit of the patent grant. Generalized "'wrongful' enforcement of patents, is activity protected under [*E. R.R. Presidents Conf. v. Noerr Motor Freight, Inc.*, 365 U.S. 127 (1961)] and [*California Motor Transp. Co. v. Trucking Unltd.*, 404 U.S. 508 (1972)], and is not subject to collateral attack as a new ground of 'misuse.'" *C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1373 (Fed. Cir. 1998). "It is not patent misuse to bring suit to enforce patent rights not fraudulently obtained, nor is otherwise legal competition such behavior as to warrant creation of a new class of prohibited commercial conduct when patents are involved." *Id.*

Defendant argues that of the four patents Plaintiff asserted in this case, "three were so weak that they were disposed of before trial," and a jury returned a defense verdict on all aspects of the fourth. (Def.'s Op. Br. 22.) Defendant believes that "[t]he most reasonable conclusion given the weakness of the patents asserted is that UEI's goal was not to win a favorable judgement, but simply to drive up URC's costs by subjecting URC to expensive litigation." (*Id.*) This case involved a host of complex issues. While Plaintiff's case was not strong, and likely suffered in many ways from Plaintiff's delay in bringing it, the Court did not see sufficient indicia of bad faith. The Court does not find that Plaintiff believed that it was asserting patents that were invalid, non-infringed, or unenforceable.

And as to res judicata, the jury instruction stated that "the plaintiff is barred from accusing of infringement in the second lawsuit any product that is essentially the same as a product that was accused of infringing the same patent in the first lawsuit." (Dkt. No. 410, Jury Instruction No. 39.) Defendant argues: "[t]hat is exactly what UEI did when it filed this lawsuit accusing the MX-500 of infringing the '426 patent for a second time." (Def.'s Op. Br. 19.) This ignores that in the prior case, Plaintiff dropped its claim for infringement of the '426 Patent before accusing the MX-500 of infringing any patents.

Lastly, while the jury found the '426 Patent invalid for improper inventorship, Defendant did not establish that Plaintiff knew that the patent was invalid, and so has not established that its assertion of the patent was in bad faith on that ground.

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The Court therefore holds that Plaintiff's assertion of the '426 Patent is not barred by patent misuse.

3.4   Plaintiff's Unclean Hands - All Patents

Final Jury Instruction No. 40 provided, in part:

> The owner of a patent may be barred from enforcing the patent against an infringer where the owner of the patent acts or acted inequitably, unfairly, or deceitfully towards the infringer or the Court in a way that has immediate and necessary relation to the relief that the patent holder seeks in a lawsuit.

(Dkt. No. 410 46.) The jury's advisory verdict was that Defendant proved by a preponderance of the evidence that Plaintiff is barred from obtaining relief due to unclean hands. (Verdict Form, Dkt. 408, Question 13.)

The "defense of patent misuse arises from the equitable doctrine of unclean hands." *C.R. Bard*, 157 F.3d at 1372. Accordingly, Defendant addressed both theories in a single section of its brief. (Def.'s Op. Br. at 19-23.) But Defendant argues that the "objectively baseless" requirement does not apply to unclean hands. (Def.'s Reply Br. 9.) And, as presented in the jury instructions, the defense of unclean hands is not limited to the '426 Patent, but instead could operate to bar relief on the other patents that were asserted before trial.

While the Court holds that laches applies to bar the assertion of the '426 Patent, Defendant has not provided authority for the proposition that unclean hands should be found whenever another equitable defense succeeds. To the contrary, "[i]t is not [independently] 'unconscionable' for a plaintiff to continue to litigate a case, even if the defendant raises a defense that is later found to be meritorious." *Hoffman-La Roche, Inc. v. Promega Corp.*, 319 F. Supp. 2d 1011, 1025 (N.D. Cal. 2004). Defendant repeatedly points to Plaintiff's intent to gain a competitive advantage from this lawsuit, but does not establish that Plaintiff acted deceitfully or unfairly.

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The one action that stands out as questionable is Plaintiff's accusing the MX-500, and then withdrawing that accusation without ever providing an explanation, other than a suggestion that it was a mistake of some kind. But Plaintiff maintained that accusation for only about three months before withdrawing it. Plaintiff argues that "[e]ven if those allegations were erroneous, UEI voluntarily corrected its mistake and cured any potential misuse." (Pl.'s Op. Br. 16.) The Court does not here address whether Defendant should be made whole for its efforts during those three months to address that particular allegation of infringement. But that incident, taken together with the entire course of the litigation and the other grounds urged by Defendant, does not show unclean hands.

The Court therefore holds that Plaintiff's claims are not barred by unclean hands.

3.5   Defendant's Unclean Hands

In a new theory not presented to the jury for an advisory verdict, Plaintiff argues that Defendant should not benefit from any equitable defenses because Defendant itself has unclean hands. Plaintiff points to Defendant's copying of its code libraries, Defendant's misrepresentation that Plaintiff had accused the MX-500 product of infringing the '426 Patent in the prior case, and Defendant's use of its relationship with Ohsung as a sword and shield during discovery. (Pl.'s Op. Br. 22-23.)

None of these issues rise to the level of unclean hands. Plaintiff had mechanisms to address any perceived discovery misconduct before trial, and Defendant's ability to secure witnesses from Korea to testify at trial does not show that it had control of those witnesses, or other Ohsung employees. Defendant's mistake about whether the MX-500 was accused of infringing the '426 Patent in the prior litigation was one of many facts that both parties could have been more careful about throughout the course of the case. And if Plaintiff thought that Defendant's copying of Plaintiff's code libraries was independently wrongful, Plaintiff could have sued for it.

The Court therefore holds that Plaintiff has not shown that Defendant's unclean hands bar it from asserting equitable defenses.

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DISPOSITION

Plaintiff's assertion of the '426 Patent is barred by laches. Plaintiff's assertion of the '426 Patent is not barred by equitable estoppel or patent misuse. Plaintiff's right to relief is not barred by unclean hands. Defendant's equitable defenses are not barred by unclean hands.

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United States Patent [19]

O'Donnell et al.

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[54] **FAVORITE KEY MACRO COMMAND AND CHAINED MACRO COMMAND IN A REMOTE CONTROL**

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[73] Assignee: **Universal Electronics Inc.,** Twinsburg, Ohio

[21] Appl. No.: **990,862**

[22] Filed: **Dec. 11, 1992**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 586,957, Sep. 24, 1990, abandoned, which is a continuation of Ser. No. 127,999, Dec. 2, 1987, Pat. No. 4,959,810, which is a continuation-in-part of Ser. No. 109,336, Oct. 14, 1987, abandoned.

[51] Int. Cl.^{6} H04L 17/02
[52] U.S. Cl. **341/176**; 348/734; 340/825.57; 359/146
[58] Field of Search 341/176; 358/194.1; 455/151.1–151.4, 352; 340/825.57, 825.69, 825.72; 359/142–148; 348/734

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Primary Examiner—John K. Peng
Assistant Examiner—Thomas J. Mullen, Jr.
Attorney, Agent, or Firm—Thomas R. Vigil

[57]   **ABSTRACT**

The remote control comprises: a microprocessor including a CPU and a memory; a keyboard including a set of keys including one or more MACRO keys coupled to the microprocessor; lamp driver circuitry coupled to the microprocessor; circuitry for generating IR signals coupled to the IR lamp driver circuitry; code data for executing command functions which can be sent to a controlled device for causing the controlled device to perform specific functions stored in the memory; an entry/definition program in the memory for enabling a user of the remote control to define a macro for selecting at least one favorite channel by entry of series of keystroke commands on the keyboard; and a playback program in the memory for enabling an operator of the remote control to effect rapid selection of at least one favorite channel upon subsequent depression of the MACRO key.

13 Claims, 7 Drawing Sheets
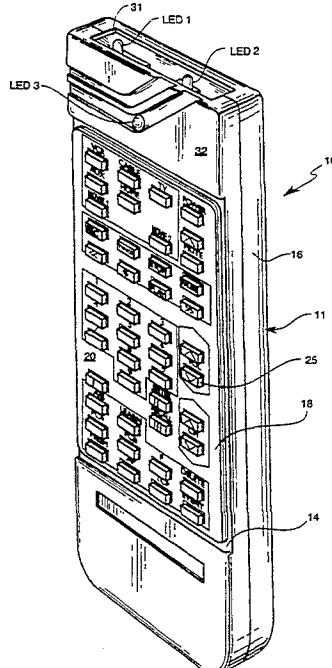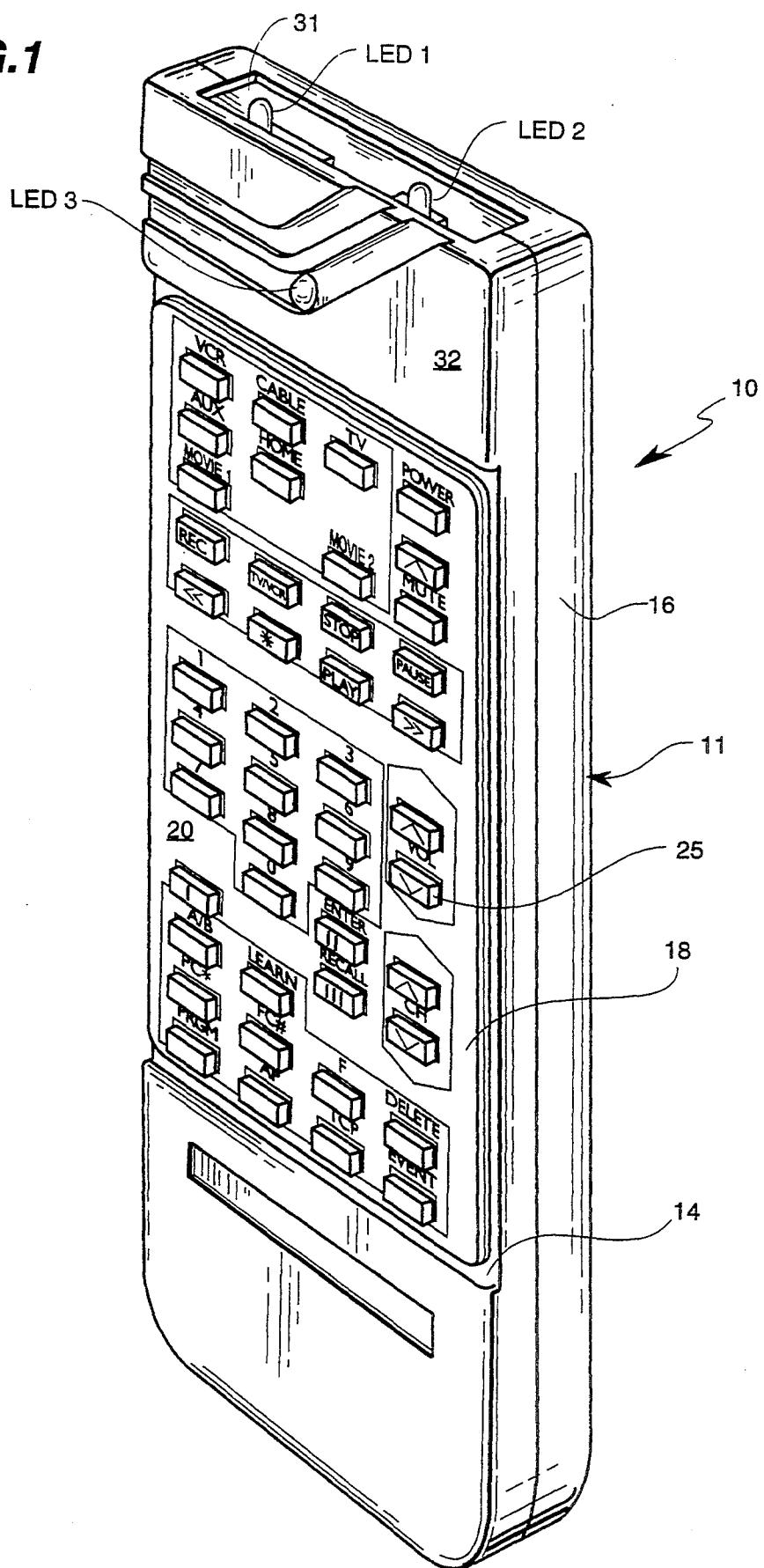
FIG.1

FIG.2

LED 3

32

11

VCR   CABLE   TV   POWER

AUX   HOME

MOVIE 1   MOVIE 2   MUTE

REC   TV/VCR   STOP   PAUSE

<<   *   PLAY   >>

1   2   3

4   5   6   VOL   25

7   8   9

0   ENTER   18

20   RECALL   CH

I

A/B   LEARN

PC*   FC#   F   DELETE

PRGM   AP   TCP   EVENT

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FIG. 3

FIG. 4

KEY PRESSED

"I" KEY? — NO

YES

NEXT KEY "III" KEY? — NO

YES

NEXT KEY A MACRO KEY? — NO

YES

PERFORM OTHER FUNCTIONS AS REQUIRED

ERROR. RESET STATUS TO NORMAL

FETCH MACRO STORAGE ROTATION COUNT FOR THAT KEY

SET MACRO RECORDING FOR KEY AND ROTATION COUNT INDICATED

NEXT KEY "I" KEY ? — YES — NEXT KEY "III" KEY ? — YES

NO

MARK END OF SEQUENCE. INCREMENT STORAGE ROTATION COUNT.

STORE KEYSTROKE VALUE

NO

ROTATION COUNT = 1 — YES — ROTATION COUNT = 4 ?

NO

DONE. RETURN TO IDLE STATE

FIG. 5

FIG. 6

FIG. 7

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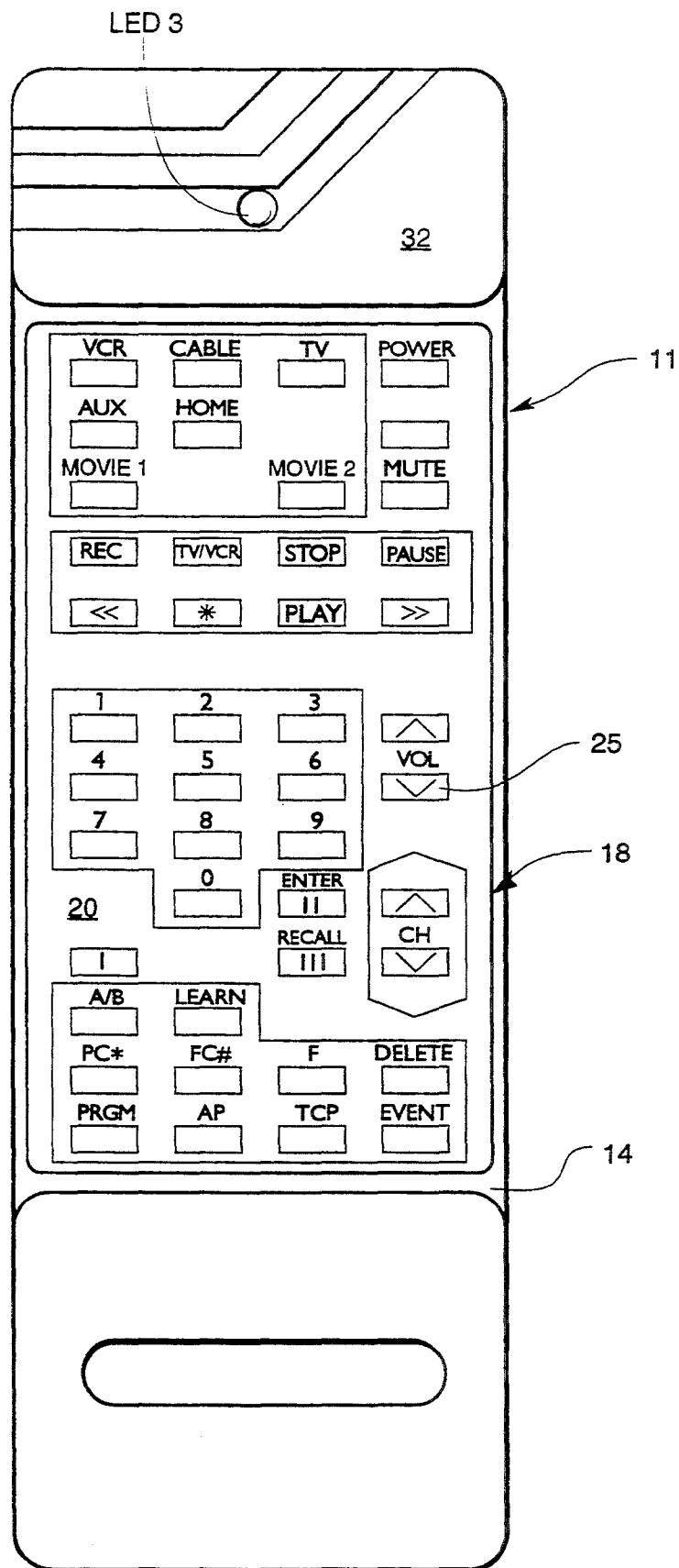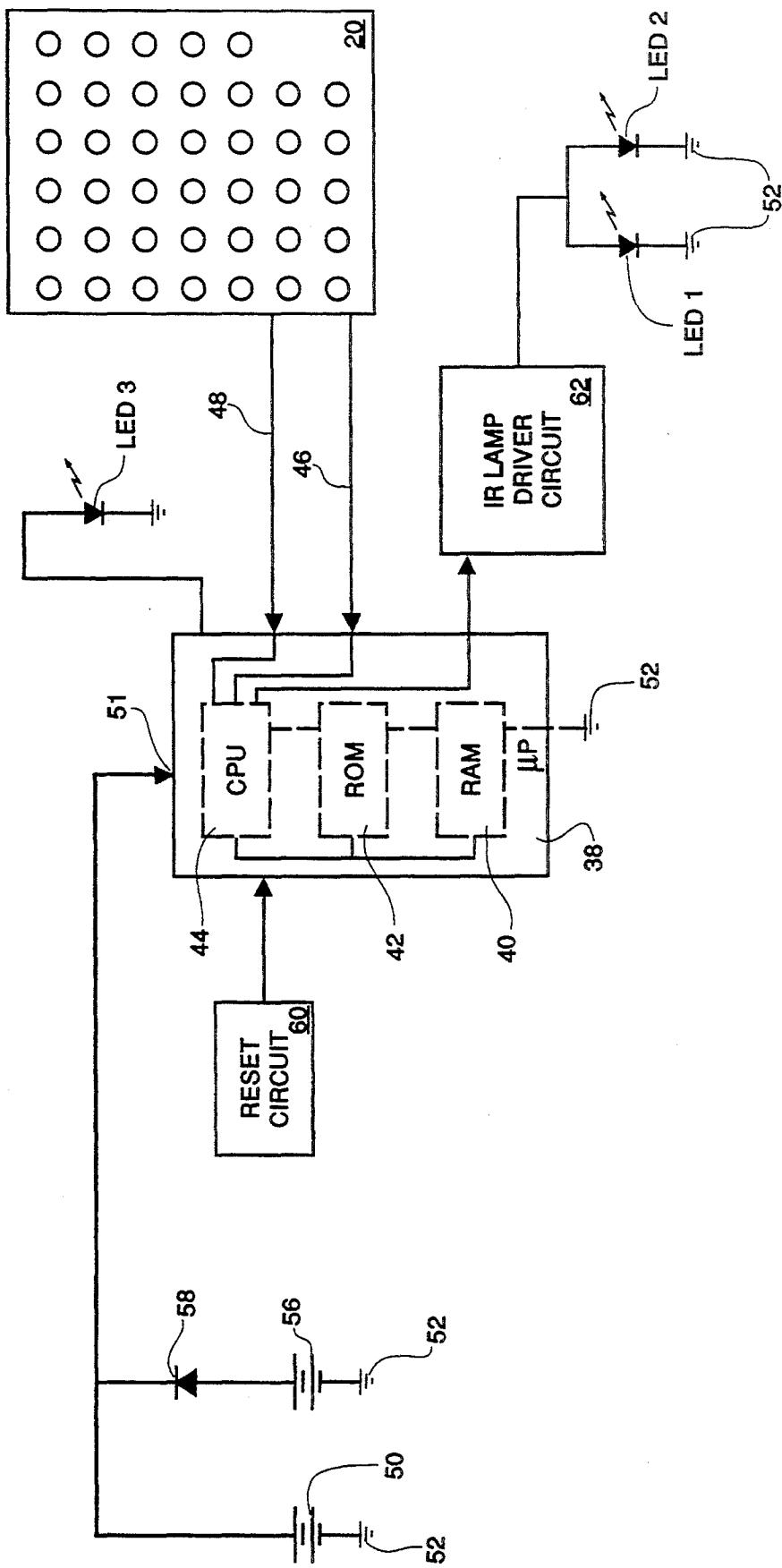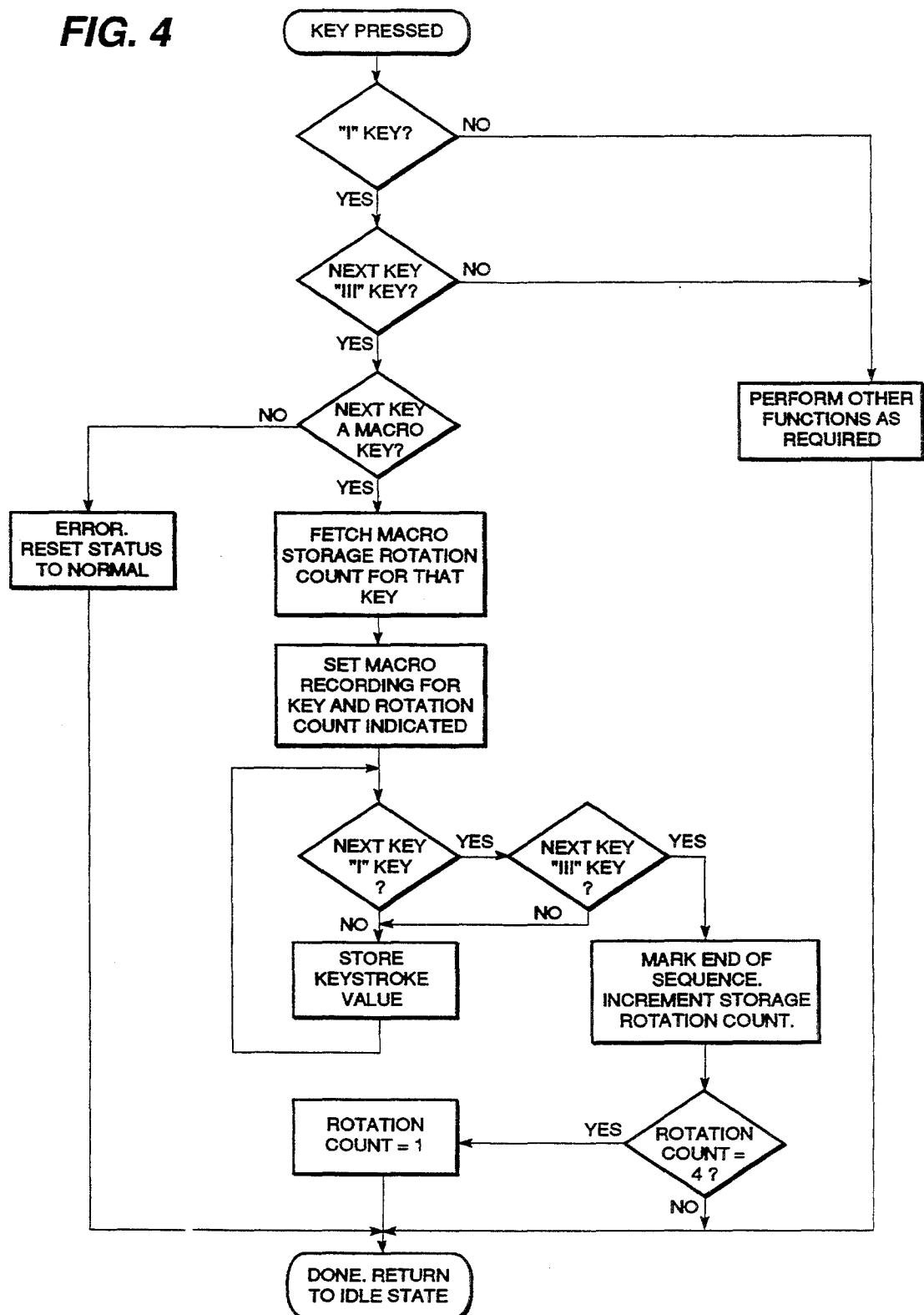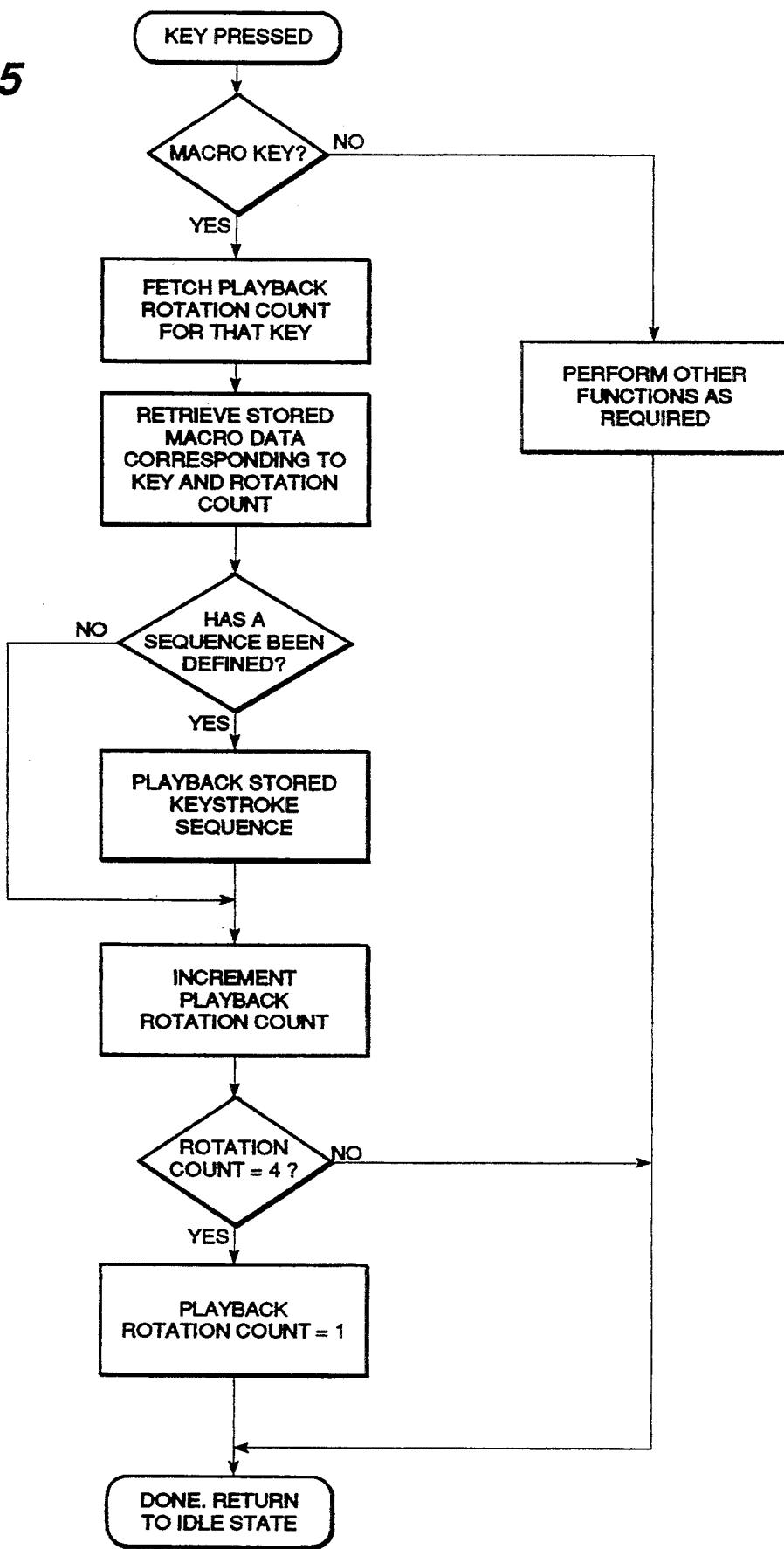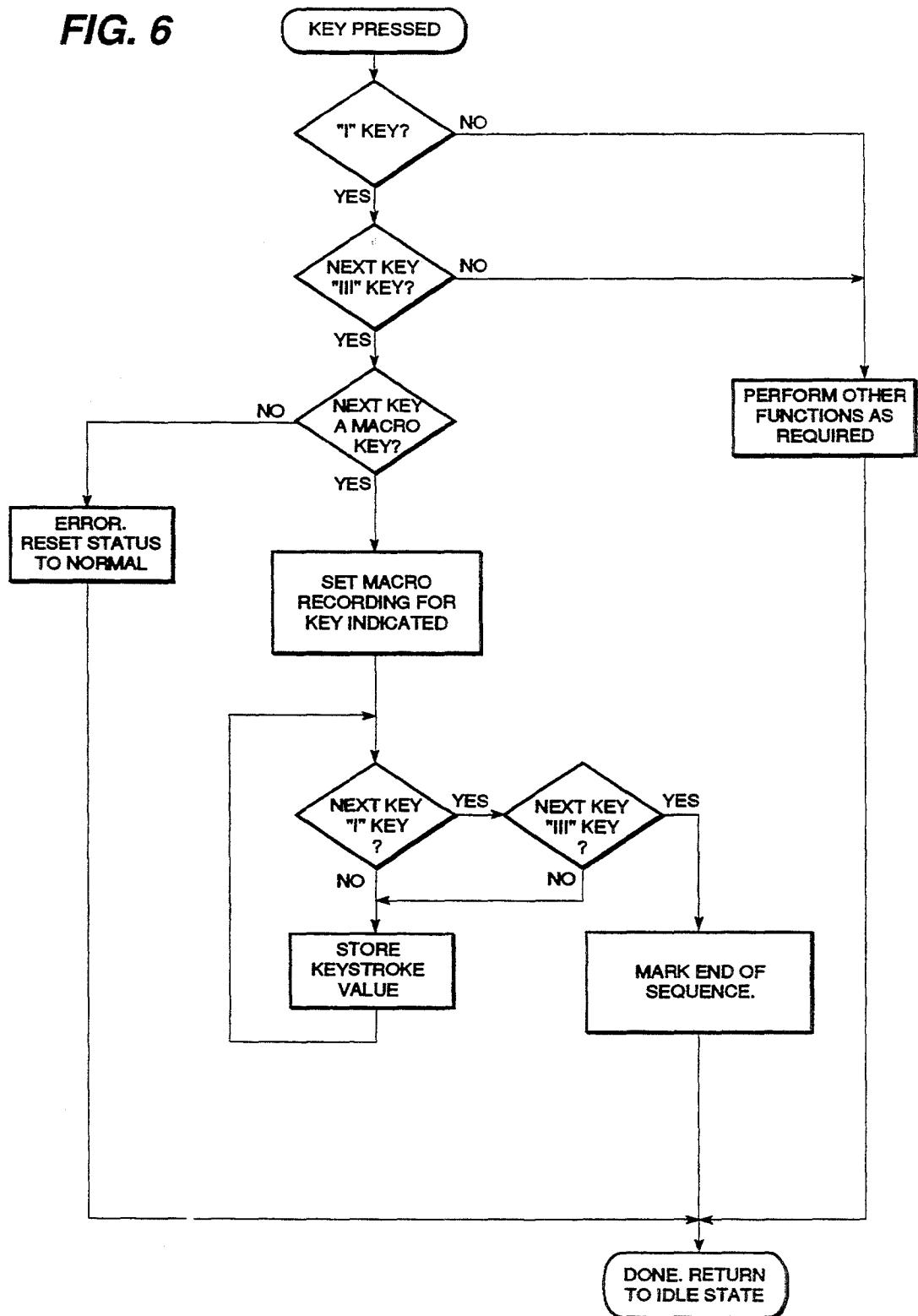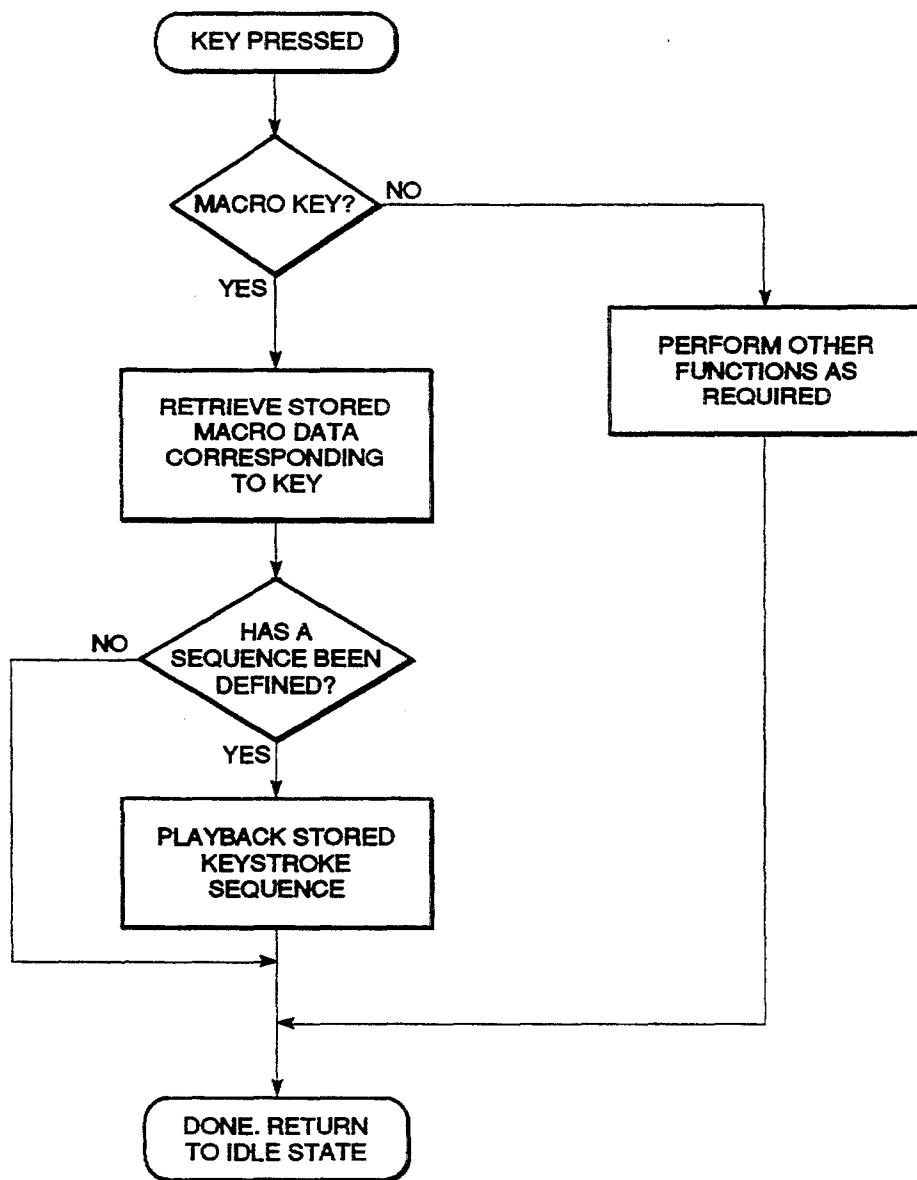
FAVORITE KEY MACRO COMMAND AND CHAINED MACRO COMMAND IN A REMOTE CONTROL

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation-in-Part of U.S. patent application Ser. No. 07/586,957, filed Sept. 24, 1990, now abandoned, which is a Continuation of U.S. patent application Ser. No. 127,999, filed Dec. 2, 1987 which issued to U.S. Pat. No. 4,959,810 on Sep. 25, 1990, which is a Continuation-in-Part of U.S. patent application Ser. No. 109,336, filed Oct. 14, 1987, abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention.

The present invention relates to a remote control of the type which is hand held and which can be coupled via coded infrared signals with a remote control receiver built into a television or other remotely controlled electrical apparatus to turn on the apparatus, such as the television, at a distance, to adjust the volume, tone and brightness, to change channels, to turn the television off and to perform other functions, and more specifically to a universal remote control wherein functions can be pre-programmed onto specific keys or pushbuttons for the convenience of the user.

2. Description of the related art including information disclosed under 37 CFR §§ 1.97–1.99

Heretofore it has been proposed to provide a reconfigurable remote control device and programmable functions for such a remote control device which will enable one to learn, store and retransmit infrared codes that are emitted from the remote control device for a remotely controlled apparatus, such as a television.

For example, in the Welles II U.S. Pat. No. 4,623,887 and the Ehlers U.S. Pat. No. 4,626,848, there is disclosed a reconfigurable remote control device which has the ability to learn, store and repeat remote control codes from any other infrared transmitter. Such a reconfigurable remote control transmitter device includes an infrared receiver, a microprocessor, a non-volatile random access memory (RAM), a scratch pad random access memory, and an infrared transmitter.

According to the teachings of the Ehlers patent, the infrared signals received by the remote control device are in bursts of pulses and the device counts the number of pulses in each burst as well as the time duration of each pause in a transmission between bursts.

The Darbee et al U.S. Pat. No. 4,959,810, of which this application is a Continuation-in-Part, discloses a universal remote control device having terminals for enabling code data to be supplied from outside the device through the terminals and a CPU to a RAM or ROM in the device.

As will be described in greater detail hereinafter, the remote control of the present invention is constructed, arranged and programmed to enable a user of the remote control to assign to one key on a keypad of the device a macro program for effecting a desired sequence of functions with one key stroke of that key and/or for enabling the user to rotate functions on successive depressions of that key, such as, for example, cycling through several different channels.

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SUMMARY OF THE INVENTION

According to the present invention there is provided a remote control comprising: a microprocessor including a CPU and a memory; a keyboard coupled to the microprocessor and including a set of keys including at least one MACRO key; IR lamp driver circuitry coupled to the microprocessor; light emitting circuitry for generating and emitting IR signals coupled to the IR lamp driver circuitry; code data stored in the memory for creating the IR signals, which are sent by the light emitting circuitry to a controlled device to cause the controlled device to perform specific command functions; a macro entry/definition program in the memory for enabling a user of the remote control to define a macro for selecting at least one favorite channel by entry of a series of keystroke commands on the keyboard; and, a macro playback program in the memory for enabling an operator of the remote control to effect rapid selection of at least one favorite channel upon subsequent depression of the at least one MACRO key.

Also according to the present invention there is provided a remote control comprising: a microprocessor including a CPU and a memory; a keyboard coupled to the microprocessor and including a set of keys including number keys and at least one MACRO key; IR lamp driver circuitry coupled to the microprocessor; light emitting circuitry for generating and emitting IR signals coupled to the IR lamp driver circuitry; code data for creating the IR signals, which are sent by the light emitting circuitry to a controlled device to cause the controlled device to perform specific command functions, stored in the memory; a macro entry/definition program stored in the memory; circuitry for entering a predetermined keystroke sequence on the keyboard; circuitry and program instructions for determining if the predetermined keystroke sequence is, according to the macro entry/definition program, a command to establish a select channel macro; circuitry and program instructions for determining, after a select channel macro command is sensed, if a number key or keys have been depressed followed by depression of the at least one MACRO key; and, circuitry and program instructions for storing the number(s) of the depressed number key or keys in association with the at least one MACRO key in the memory.

Further according to the present invention there is provided a method for entering a channel select macro by depressing at least one MACRO key on a keypad in a remote control, the remote control including: a microprocessor including a CPU and a memory; a keyboard coupled to the microprocessor and including the keypad which comprises a set of keys including number keys and at least one MACRO key; IR lamp driver circuitry coupled to the microprocessor; light emitting circuitry for generating IR signals coupled to the IR lamp driver circuitry; code data for creating the IR signals, which are sent by the light emitting means to a controlled device to cause the controlled device to perform specific command functions, stored in the memory; and, a macro entry/definition program stored in the memory, the method comprising the steps of: entering a predetermined keystroke sequence on the keypad; determining if the predetermined keystroke sequence is, according to the macro entry/definition program, a command to establish a select channel macro; and, if so, determining if, subsequently, a number key or keys have been depressed followed by de-

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pression of the at least one MACRO key; and, storing the number(s) of the depressed number key or keys in association with the at least one MACRO key in the memory.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of a remote control constructed according to the teachings of the present invention.

FIG. 2 is a front plan view of the remote control 10 shown in FIG. 1 and shows the various keys or push buttons of the remote control.

FIG. 3 is a block electrical schematic circuit diagram of the remote control shown in FIGS. 1 and 2.

FIG. 4 is a flow chart of the steps performed by a macro entry definition program stored in the remote control and entitled: ROTATING MACROS: entry and definition.

FIG. 5 is a flow chart of the steps performed by a macro playback program stored in the remote control and entitled: MACRO: playback.

FIG. 6 is a flow chart of the steps performed by a single e.g., favorite channel, macro stored in the remote control and entitled: SELECTED CHANNEL MACRO: entry and definition.

FIG. 7 is a flow chart of the steps performed by a single, e.g., favorite channel, macro stored in the remote control and entitled: SELECTED CHANNEL MACRO: playback.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring now to FIG. 1 in greater detail, there is illustrated therein a remote control 10 constructed according to the teachings of the present invention.

As shown, the remote control 10 includes a housing 11 including an upper housing member 12 having a base panel 14, and a lower housing member 16. An overlay face panel 18 is positioned over the base panel 14 and has a keyboard layout, i.e. keypad 20, on the outer surface thereof.

The two panels 14 and 18 have openings therethrough for receiving elastomeric pushbuttons 25, for the keypad 20, all of which extend from and are fixed to or integral with an elastomeric body panel.

The pushbuttons 25 are arranged in rows and columns and are identified as follows on the keypad 20:

VCR	CABLE	TV	POWER
AUX	HOME		
MOVIE 1		MOVIE 2	MUTE
REC	TV/VCR	STOP	PAUSE
<<	*	PLAY	>>
1	2	3	
			VOL
4	5	6	
7	8	9	
		0	ENTER
			CH
1		RECALL	
A/B	LEARN		
PC*	FC#	F	DELETE
PRGM	AP	TCP	EVENT

This arrangement is shown in FIG. 2, and the manner in which some of these pushbuttons 25 are utilized in operating the remote control 10 will be described in greater detail hereinafter.

At a top or forward end 28 of the remote control 10 there is provided an opening 30 for two light emitting

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diodes LED 1 and LED 2. The opening 30 is covered by an infrared-transparent lens 31. Also provided on a top surface 32 of the upper housing member 12 of the remote control 10 is a light emitting diode, LED 3, by which information is communicated to the user of the remote control 10.

FIG. 2 is a plan view of the keyboard or keypad 20 and shows the different keys or pushbuttons 25 of the remote control 10 extending through the base panel 14 of upper housing member 12 and the face panel 18 where the label or identification for each pushbutton or key 25 is shown. The light emitting diode LED 4 is also indicated.

FIG. 3 is a block electrical schematic circuit diagram of the operating circuitry 36 in the remote control 10 which includes a microprocessor 38, including a RAM 40, a ROM 42 and a CPU 44. The keypad 20 is coupled to the microprocessor 38 by an interrupt line 46 and a bus 48 to the CPU 44.

A power supply in the form of a battery 50 is connected between a +voltage input 51 to the microprocessor 38 and a system ground 52. A backup battery 54 is connected through a diode 56 to the +voltage input 51 to maintain the data stored in the memory 42 and/or 44 to provide a non-volatile system.

A reset circuit 58 is coupled to the microprocessor 38, as shown.

An output of the CPU 44 is connected to an IR lamp driver circuit 62 which outputs a voltage to the two light emitting diodes LED 1 and LED 2.

The status indicating LED 3 is also connected to an input of the CPU 44.

The electrical circuitry 36 is generally of the type disclosed in greater detail in the Darbee et al U.S. Pat. No. 4,959,810, the disclosure of which is incorporated herein by reference, and can be a modified circuit, e.g., it can be for a dedicated remote, as opposed to a universal remote control.

The operating programs for the remote control 10 which is stored in the ROM 42 or RAM 40 are similar to the operating programs disclosed in the Darbee et al U.S. Pat. No. 4,959,810, incorporated herein by reference, with the exception of parts of the favorite channel macro program and of the rotating macro program for selecting a sequence of three pre-selected channels.

With reference to FIGS. 4 and 5, the remote control 10 of the present invention has stored in the memory thereof (RAM or ROM) a program for enabling one to press one key or button to establish a rotating macro program whereby the first keystroke on a selected key will cause the remote control 10 to emit IR command function signals to a controlled device, such as the television, to set the television to one pre-selected channel. A second depression of the selected key will cause the remote control to emit IR command function signals to cause the television to move to a second preselected channel. Then, a third key stroke of the selected key will cause the remote control 10 to emit IR command function signals to cause the television to move to a third pre-selected channel.

To establish the rotating macro, the keyboard 20 has special rotating MACRO keys. In the particular implementation of the remote control 10 shown in the drawings, these keys are labelled MOVIE 1 for "SHOWTIME", for example and MOVIE 2 for "HBO", for example. These MACRO keys can be colored a special color, e.g., red.

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To define the macro one presses the I key (which also can be labeled and/or referred to as the "DO" key), then the RECALL (or III) key followed by the MACRO key to be defined. Then the operator presses a channel key or keys, e.g., such as 1 and 2 for channel 12 or can press the CABLE key and a desired cable channel, e.g. 32, finally pressing the DO (or I) key followed by the RECALL (or III) key.

The program then decrements a rotation counter and repeats the above-defined steps for another selected channel until one has entered three selected channels.

If one attempts to establish a fourth macro for a fourth selected channel, the first macro for the first selected channel will be erased and overwritten.

If only one selected macro is created, the second and third keystrokes of a MACRO key will cause nothing to happen and the fourth keystroke will repeat the selection of the first selected macro to select the single selected channel.

To erase the macro, one presses the DO (or I) key, the 0 key followed by the RECALL (or III) key.

As apparent from a study of FIG. 4, the program first determines whether a depressed key or keystroke is the "I" key. If not, the program performs other functions as required and exits to the idle state.

If yes, the program then determines if the next keystroke is the "III" key. If not, the program performs other functions as required and exits to an idle state.

Then the program determines if the third keystroke is a MACRO key.

If not, there is an error and the program resets to the idle state.

Next the program will fetch the macro number storage rotation, for that keystroke of that MACRO key.

Next the program sets the macro for recording the keystroke and rotation count indicated.

This is followed by a determination if the subsequent keystroke is a "I" keystroke. If not, the keystroke value for that channel is stored in memory.

Then when it is determined that a subsequent keystroke is the "I" key, a determination is made if the next subsequent keystroke is the "III" key. If no, the program cycles back. If yes, the program marks the end of the sequence and increments the storage rotation count.

Then if the rotation count equals 4, the program renumbers the rotation count to equal 1 and exits to the idle state. If the rotation count is less than 4, the program simply exits to the idle state.

Turning now to FIG. 5, there is illustrated therein the macro playback program. Here, a determination is made if a MACRO key has been struck. If not, the program performs other functions as required and exits to the idle state.

If yes, the program fetches the playback rotation count for that macro key. Then, the stored macro data corresponding to the key and rotation count is retrieved from memory.

Next a determination is made if a sequence has been defined. If yes, the stored stroke sequence is played back followed by incrementing of the playback rotation count.

If the answer was no, the program goes directly to the incremented playback rotation count.

Then a determination of the rotation count is made and, if the count is less than 4, the program exits to the idle state.

If the rotation count is 4, the rotation count playback is set equal to 1 and the program exits to the idle state.

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A variation of the rotating macro program is a macro program, similar to the macro program illustrated in FIGS. 18A and 18B of U.S. Pat. No. 4,959,810 of which this application is a continuation-in part and the disclosure of which is incorporated herein by reference, for setting a MACRO key to cause the remote control 10 to select a favorite channel. For this purpose the remote control 10 is provided with a program for selecting a single, favorite channel.

The routine protocol or steps of the macro for establishing a selected channel key is shown in FIG. 6. An examination of FIG. 6 will readily show that this favorite channel macro is similar to the rotating macro.

In this respect, one first presses the I key followed by the RECALL (or III) key, a MACRO key and the channel number key or keys for the channel selected.

Then, as shown in FIG. 7, to call up a favorite channel, one presses the MACRO key which will retrieve the stored macro data concerning the favorite channel corresponding to that MACRO key.

From the foregoing description, it will be apparent that the remote control 10 of the present invention and the method (or programs) for operating same to enter and define a rotating channel sequence macro or a favorite channel macro enables a user of the remote control to customize his remote control for his preference in viewing one to three favorite channels.

Moreover, it will be apparent from the foregoing description that modifications can be made to the remote control and method for operating same without departing from the teachings of the present invention.

Accordingly, the scope of the invention is only to be limited as necessitated by the accompanying claims.

We claim:

1. A remote control comprising:

a microprocessor including a CPU and memory means;

a keyboard coupled to said microprocessor and including a set of keys including at least one MACRO key;

IR lamp driver circuitry coupled to said microprocessor;

light emitting means for generating and emitting IR signals coupled to said IR lamp driver circuitry;

code data stored in said memory means for creating the IR signals, which are sent by said light emitting means to a controlled device to cause the controlled device to perform specific command functions;

a macro entry/definition program in said memory means for enabling a user of said remote control to define a macro for selecting at least one favorite channel by entry of a series of keystroke commands on said keyboard; and,

a macro playback program in said memory means for enabling an operator of said remote control to effect rapid selection of at least one favorite channel upon subsequent depression of said at least one MACRO key.

2. The remote control of claim 1 wherein said macro entry/definition program includes means for establishing and recalling three selected channels upon depression of a predetermined series of keystrokes and the at least one MACRO key.

3. The remote control of claim 2 wherein said keyboard further includes specific keys designated to initiate macro definition and strokes of said specific keys define the predetermined series of keystrokes.

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4. The remote control of claim **1** wherein said set of keys include number keys that are numbered in accordance with channel numbers.

5. A method for entering a channel select macro by depressing at least one MACRO key on a keypad in a remote control, said remote control including:

a microprocessor including a CPU and memory means;

a keyboard coupled to said microprocessor and including the keypad which comprises a set of keys including number keys and the at least one MACRO key;

IR lamp driver circuitry coupled to the microprocessor;

light emitting means for generating IR signals coupled to the IR lamp driver circuitry;

code data stored in said memory means for creating the IR signals, which are sent by said light emitting means to a controlled device to cause the controlled device to perform specific command functions; and,

a macro entry/definition program stored in said memory means,

said method comprising the steps of:

entering a predetermined keystroke sequence on the keypad;

determining if the predetermined keystroke sequence is, according to the macro entry/definition program, a command to establish a select channel macro; and, if so,

determining if, subsequently, a number key or keys have been depressed followed by depression of the at least one MACRO key; and,

storing the number(s) of the depressed number key or keys in association with the at least one MACRO key in said memory means.

6. The method of claim **5** wherein the keyboard further includes a DO key and a RECALL key and said step of entering a predetermined keystroke sequence comprises the steps of depressing the DO key, the RECALL key and the at least one MACRO key.

7. The method of claim **4** further including the steps of:

identifying and storing in the memory means, the end of the sequence of keystrokes entered which is followed by the first depression of the at least one MACRO key;

determining if a rotation count of macro keystrokes equals four; and, if not,

returning the remote control to an idle or ready state; and, if the rotation count equals 4,

resetting the rotation count to equal one and then returning the remote control to said idle or ready state.

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8. The method of claim **7** including the further step of repeating the steps of claim **4**.

9. The method of claim **8** including the further step of repeating the steps of claim **6** and then the steps of claim **4**.

10. A remote control comprising:

a microprocessor including a CPU and memory means;

a keyboard coupled to said microprocessor and including a set of keys including number keys and at least one MACRO key;

IR lamp driver circuitry coupled to said microprocessor;

light emitting means for generating and emitting IR signals coupled to said IR lamp driver circuitry;

code data stored in said memory means for creating the IR signals, which are sent by said light emitting means to a controlled device to cause the controlled device to perform specific command functions;

a macro entry/definition program stored in said memory means;

means for determining if a predetermined keystroke sequence entered on the keyboard is, according to said macro entry/definition program, a command to establish a select channel macro;

means for determining, after a select channel macro command is sensed, if one or more of said number keys have been depressed followed by depression of the at least one MACRO key; and,

means for storing the number(s) of the depressed number key or keys in association with the at least one MACRO key in said memory means.

11. The remote control of claim **10** further including:

means for identifying and storing in said memory means the end of the sequence of keystrokes entered which is followed by the first depression of the at least one MACRO key;

means for determining if a rotation count of the at least one macro keystrokes equals four;

means for returning said remote control to an idle or ready state when the rotation count is not equal to four; and,

means for resetting the rotation count to equal one and then returning said remote control to said idle or ready state when the rotation count is equal to four.

12. The remote control of claim **10** wherein said keyboard further includes a DO key and a RECALL key and said predetermined keystroke sequence includes depressing the DO key, the RECALL key, and the at least one MACRO key.

13. The remote control of claim **10** wherein said number keys are numbered in accordance with channel numbers.

* * * * *

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United States Patent [19]

Park

[11] **Patent Number:** **5,568,367**

[45] **Date of Patent:** **Oct. 22, 1996**

[54] **REMOTE CONTROL WITH KEY LIGHTING**

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[73] Assignee: **Universal Electronics Inc.**, Twinsburg, Ohio

[21] Appl. No.: **359,472**

[22] Filed: **Dec. 20, 1994**

[30]   **Foreign Application Priority Data**

Jun. 8, 1994 [KR]   Rep. of Korea 13251

[51] **Int. Cl.^{6}** **F21V 33/00**
[52] **U.S. Cl.** **362/109**; 362/30; 362/85; 362/234; 362/251; 200/314
[58] **Field of Search** 200/310, 313, 200/314, 317; 362/23, 24, 29, 85, 109, 30, 251, 234

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Primary Examiner—Denise L. Gromada
Assistant Examiner—Alan B. Cariaso
Attorney, Agent, or Firm—Thomas R. Vigil

[57]   **ABSTRACT**

The hand held, battery operated remote control with key lighting for controlling an appliance from a remote location comprises: a housing having openings through an upper wall thereof; a plurality of transparent or translucent push-buttons each extending upwardly through one of the openings; one of the push-buttons being a light actuation button; a plurality of switches each associated with one of the push-buttons; a light emitting circuit located inside the housing and including at least one light emitting element positioned in the housing at a location not under a push button, light dispersing structure for illuminating one or more of the push-buttons with light from the at least one light emitting element, and circuitry for maintaining the light emitting circuit activated for a short period of time after said one of the switches is closed by depression of the light actuation button.

16 Claims, 4 Drawing Sheets
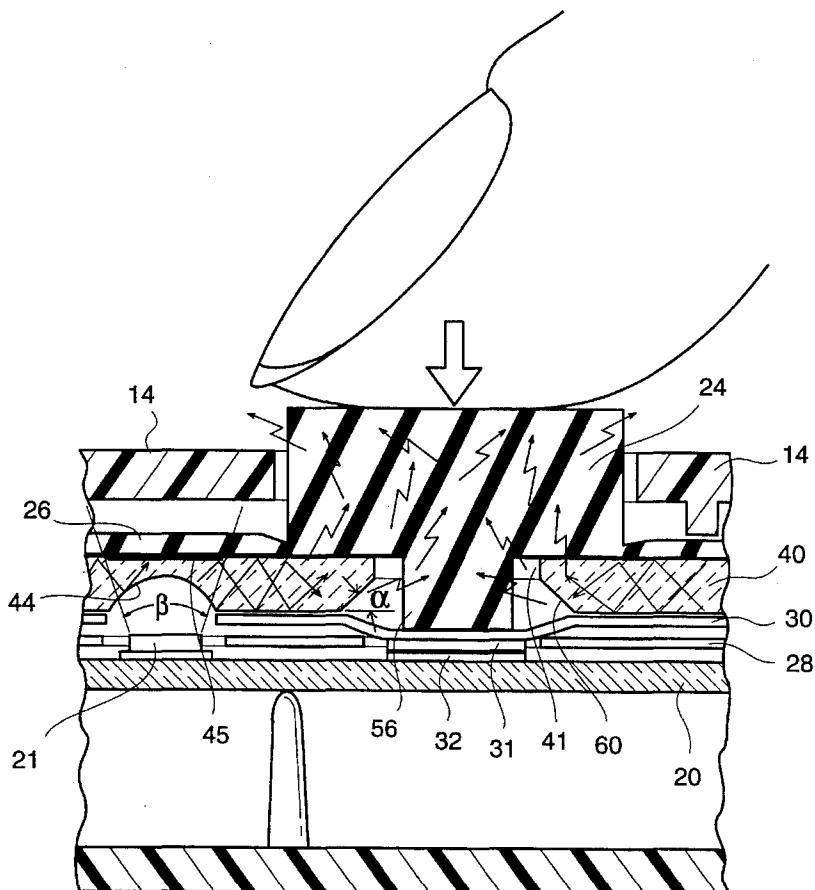
A001012

U.S. Patent   Oct. 22, 1996   Sheet 1 of 4   **5,568,367**

FIG. 1
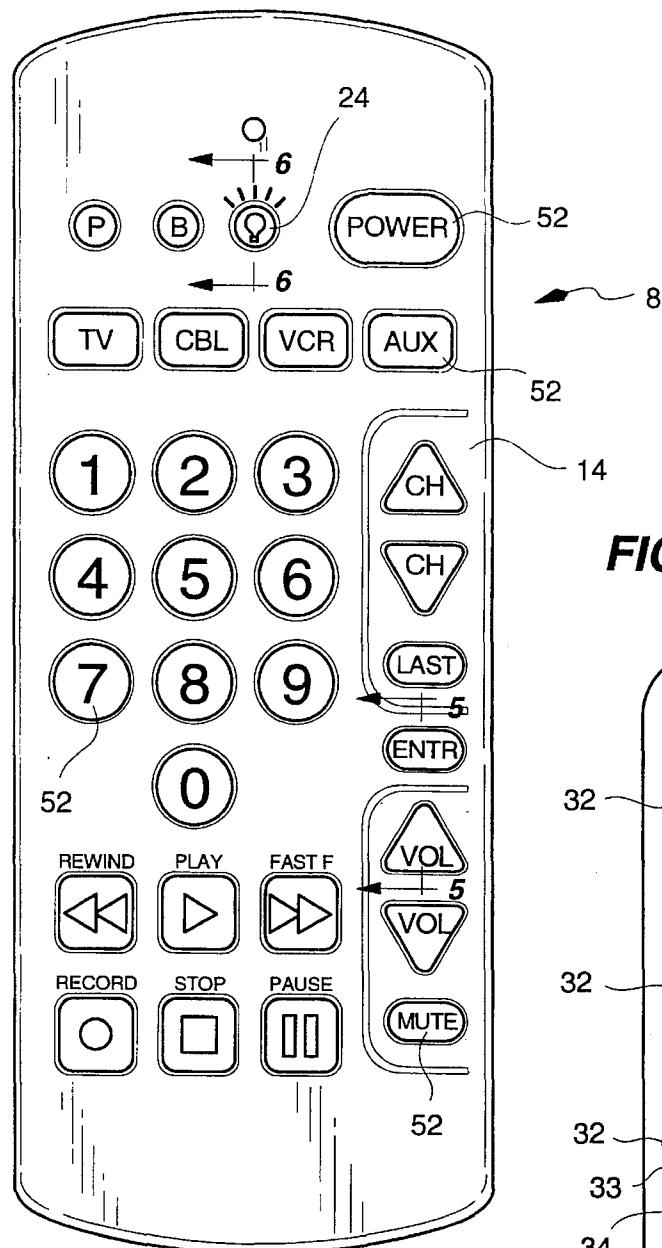
FIG. 2
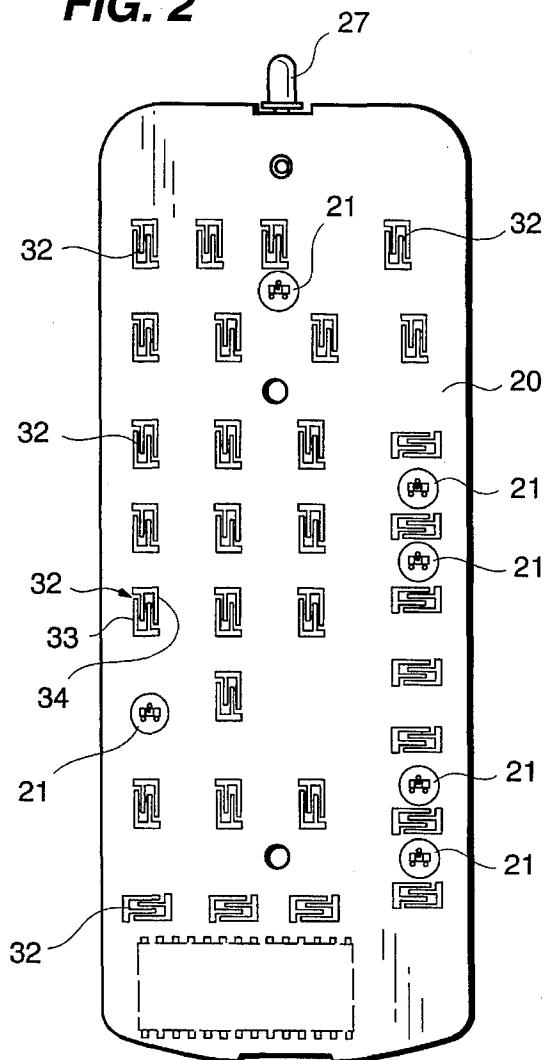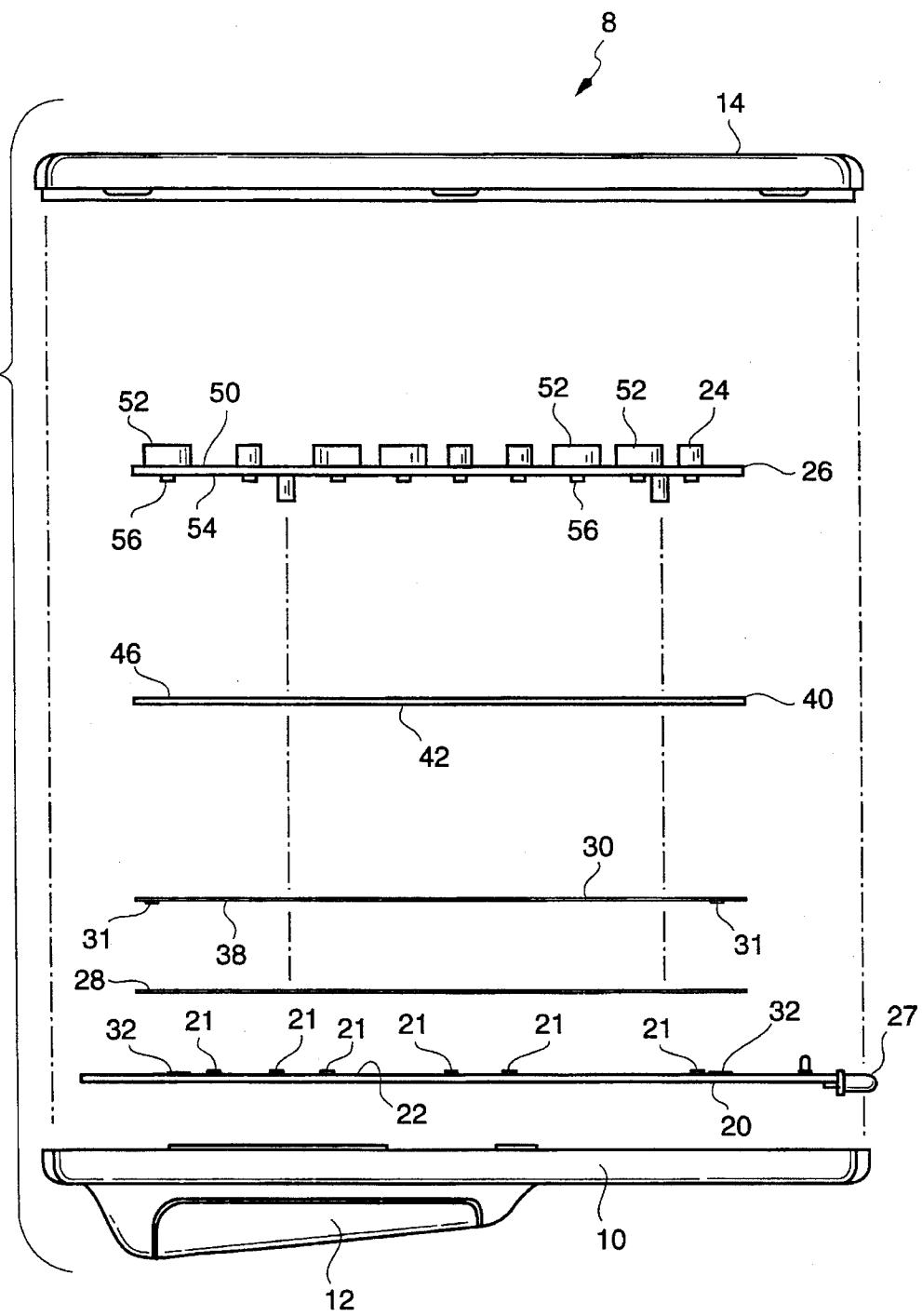
FIG. 3

**U.S. Patent**   Oct. 22, 1996   Sheet 3 of 4   **5,568,367**

FIG. 4

FIG. 5
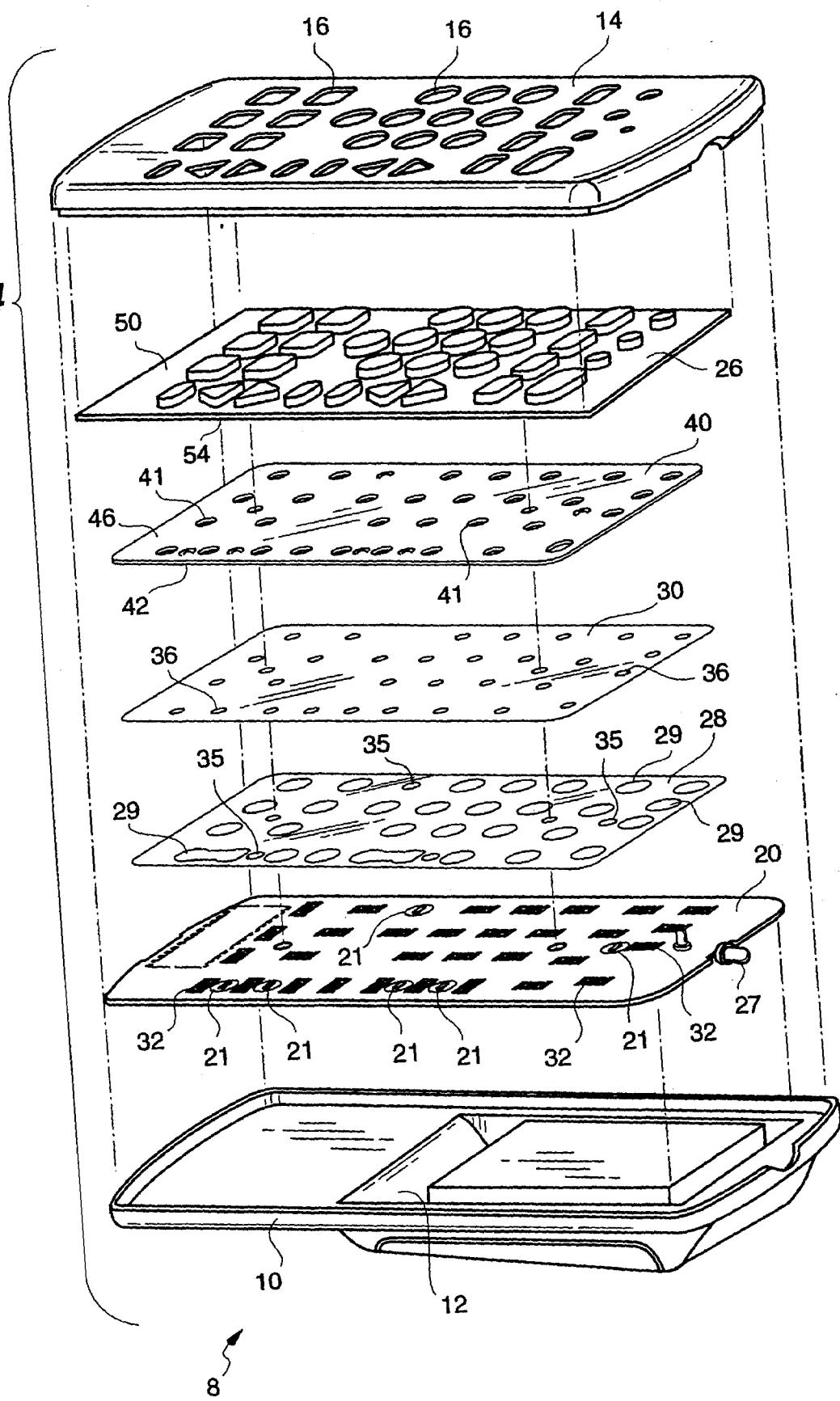
FIG. 6

5,568,367
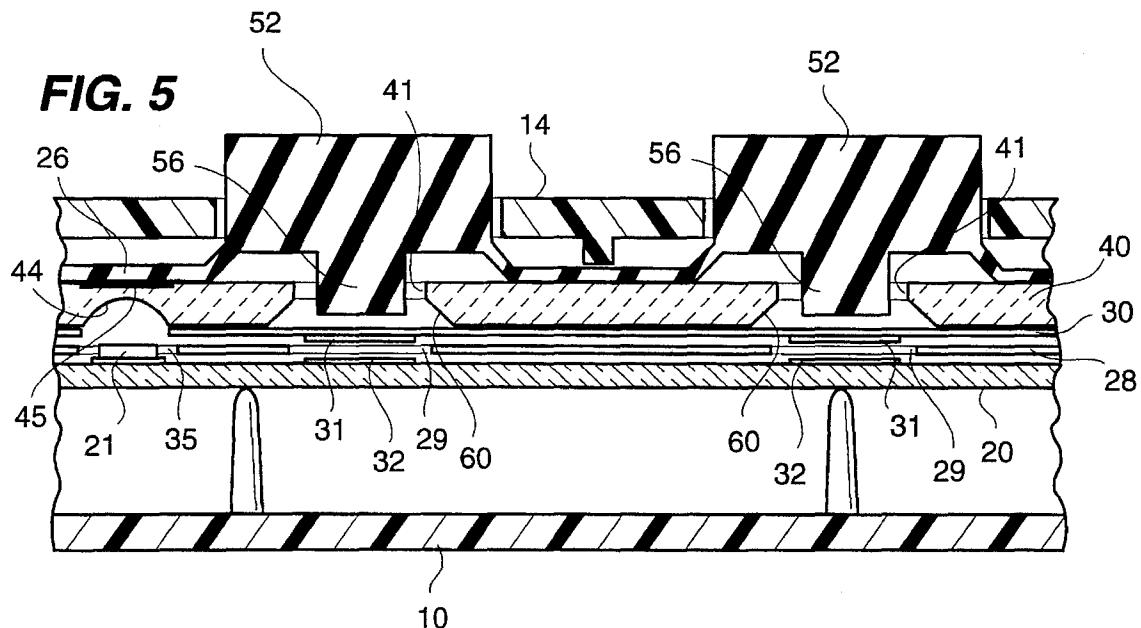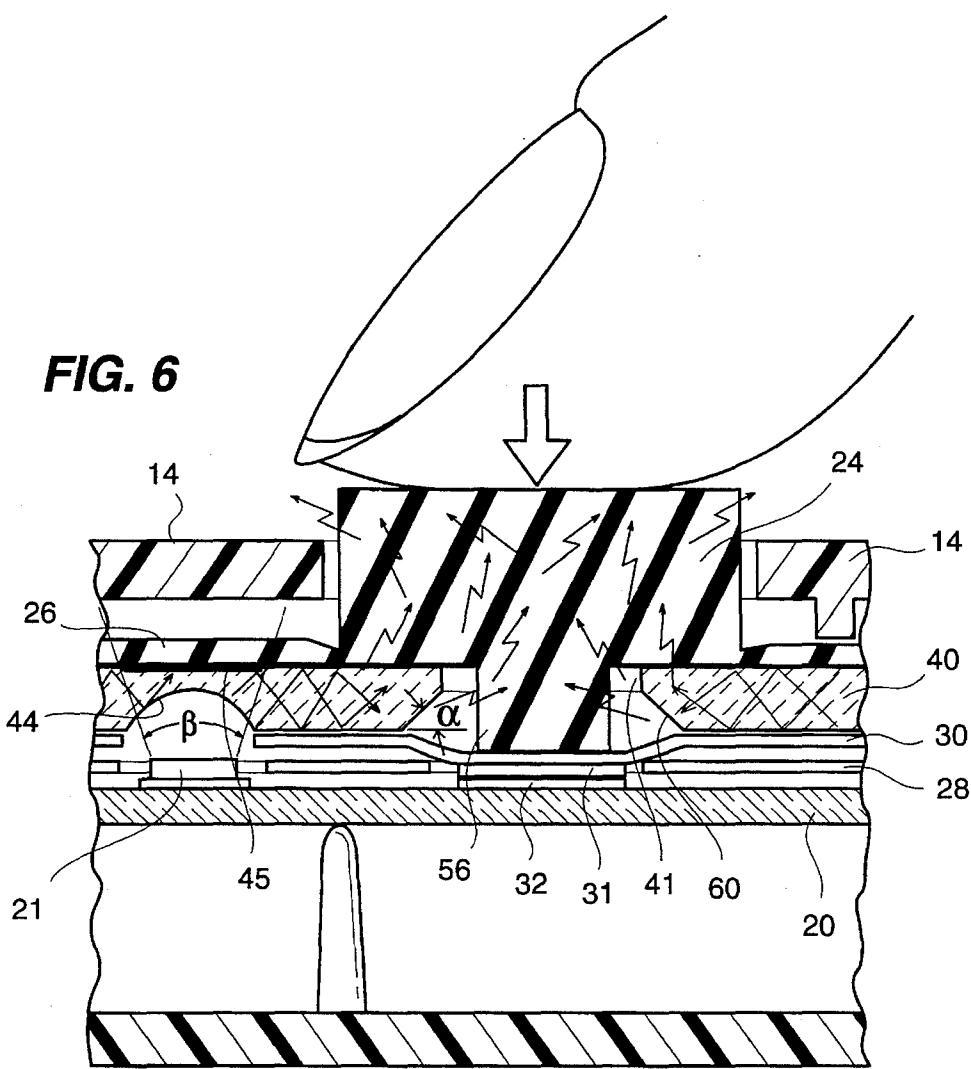
1

REMOTE CONTROL WITH KEY LIGHTING

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a remote control with key lighting to enable a user of the remote control easily to distinguish characters, numbers and symbols of keys or push-buttons on a keyboard of the remote control that are indicative of functions performable upon depression of those keys, the key lighting being provided at night or in a dark place by light emitted from light emitting elements in the remote control.

2. Description of the Prior Art

Generally, remote controls are used to remotely control various household electric appliances or mechanisms at a remote place by use of a variety of frequencies, pulse codes and electric waves including radio waves and infra-red light pulse sequences. For a convenient use, a remote control may be additionally provided with control buttons to have various additional functions. As a result, the remote control may have a complex construction. In spite of such a complex construction, there is no difficulty to manipulate the remote control in a lighted place because characters, numbers and symbols, indicative of functions which can be performed upon depression of the control keys or push-buttons easily can be distinguished. In a dark place, however, it is difficult for a user to find a desired key or button from a number of control keys or buttons. Therefore, it is desirable to provide a remote control capable of being easily manipulated even in a dark place.

Heretofore, various devices have been proposed for attachment to a remote control for illuminating the keys thereof. Examples of such devices and remote controls are disclosed in the following U.S. patents:

U.S. Pat. No.	PATENTEE
4,905,127	Kaminski
4,949,230	Burmeister
5,010,462	Mintzer
5,055,977	Acquanetta
5,063,484	Tanaka
5,122,937	Stoudemire
5,172,974	Riban
5,183,325	Hurdle
5,188,448	Siriani et al.
5,203,622	Sottile
5,205,637	Caspari

A typical prior art remote control comprises a housing including a lower case having a circuit board laid on the lower case and a contact plate disposed on the circuit board and adapted to have contacts thereon pressed against contacts on the circuit board for selectively establishing closed circuits on the circuit board. On the contact plate, a key or button fixing plate and a rubber plate having a plurality of keys or buttons are seated. The key or button fixing plate guides the buttons to cause a selected contact accurately to come into corresponding contact with a selected contact on the circuit board. The housing also includes an upper case disposed over the rubber plate. Through the upper case, the keys or buttons protrude upwardly. In the conventional remote control having the construction described above, it is very difficult to find a desired key or button in a dark place without using a separate lighting appliance.

Many of the U.S. patents referred to above are directed to some form of device having a keyboard lighting system and

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structure for attachment of the device to a remote control in an attempt to solve this problem.

The Tanaka U.S. Pat. No. 5,063,484 discloses a remote control unit comprising a body case or housing including side riser portions at least one of which has a light admitting hole. Between the riser portions, the case has a recess including a floor having holes through which push-button switches extend upwardly. A door is provided which has corresponding push-buttons and which is mounted for pivotal movement from a closed position that is in the recess between the riser portions and adjacent the floor, and is a position where light is projected into a light conducting planar member surrounding the push-buttons to illuminate the push-buttons, to an open position where the light admitting hole is now unobstructed so that light can illuminate directly the push-button switches.

SUMMARY OF THE INVENTION

An object of the present invention is to eliminate the problem encountered in the prior art remote controls by providing a simple lighting system incorporated into a remote control for intermittent lighting of the keys or push-button switches of the remote control, thus, to provide a remote control in which a user can easily find a desired control button in a dark place in order to press a key accurately to perform a desired function.

According to the teachings of the present invention there is provided a remote control for remote controlling an appliance from a place remote from the place of the appliance. The remote control comprises: a circuit board having circuits for performing various remote control functions, having a light emitting circuit including at least one light emitting element and having a plurality of spaced first contacts, one of which is associated with the light emitting circuit; a contact plate disposed over the circuit board and having a plurality of spaced apart second contacts which can individually and selectively be moved against one of the first contacts to close respective ones of the remote control circuits, the plurality of second contacts including a light actuation contact which selectively can be moved into contact with one of the first contacts associated with the lighting circuit for closing the light emitting circuit; the at least one light emitting element being disposed at a predetermined position on the circuit board to protrude upwardly from the circuit board and being connected into the light emitting circuit, the light emitting circuit being constructed and arranged to cause the light emitting element to emit light for several seconds at an activated state established when the light emitting circuit is closed by the first and second contacts associated with the light emitting circuit coming into contact with each other; the contact plate having at least one through hole therethrough adapted to allow light to pass upwardly therethrough from the light emitting element; a transparent or translucent elastomeric plate having, at an upper surface thereof, a plurality of upwardly protruding push-buttons corresponding respectively to the first contacts which overlie and correspond to the second contacts and having at, a lower surface thereof, a plurality of downwardly extending pressing projections; and, a transparent or translucent button fixing or locating plate having a plurality of through holes which receive and serve to fix, locate and guide each downwardly extending pressing projection against one of the first contacts to cause it to come into aligned contact with its associated second contact to ensure accurate closing of circuits, whereby, when the button associated with the first contact associated with the light

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emitting circuit is depressed to bring it into contact with its associated second contact, the light emitting circuit is closed and the light emitting element projects light against the transparent or translucent fixing plate which scatters light emitted from the light emitting element and the scattered light is spread along all of the transparent or translucent fixing plate and into the buttons thereby illuminating same to a user of the remote control.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and aspects of the invention will become apparent from the following description of embodiments with reference to the accompanying drawings in which:

FIG. 1 is a top plan view of the remote control constructed according to the teachings of the present invention.

FIG. 2 is a top plan view of a circuit board mounted within the remote control shown in FIG. 1.

FIG. 3 is an exploded side view of the remote control shown in FIG. 1 and shows a bottom housing portion, the circuit board, four plates and a top housing portion.

FIG. 4 is an exploded upper angular view of the bottom housing portion, the circuit board, the four plates and the top housing portion shown in FIG. 3.

FIG. 5 is a fragmentary sectional view of two push-button switch assemblies and of one light emitting diode and is taken along line 5—5 of FIG. 1.

FIG. 6 is a fragmentary sectional view of a light actuating push-button switch assembly and one light emitting diode and is taken along line 6—6 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring to FIGS. 1–4, there is illustrated therein a remote control **8** constructed in accordance with the teachings of the present invention. The remote control **8** includes a lower case or bottom housing portion **10** (FIGS. 2 and 3) having a battery receiving chamber **12** and an upper case or top housing portion **14** having a plurality of push-button receiving holes **16** (FIG. 4) therein.

On the lower case **10**, a circuit board **20** (FIG. 2) is seated which carries remote control circuits for various functions. The circuit board **20** is also provided with a plurality of light emitting elements, LED's **21**, namely six (6) LED's **21**, which protrude upwardly from an upper surface **22** of the circuit board **20**. The light emitting elements **21** are connected with a lighting circuit on the circuit board **20**. The lighting circuit is constructed and arranged to cause the light emitting elements **21** to emit light for several seconds upon pushing a light actuation push-button **24** extending upwardly from and being integral with an upper transparent or translucent elastomeric plate **26**.

The circuit board also has a light signal emitting LED **27** mounted at an upper end of the circuit board **20**.

A spacer, insulating plate **28** with holes **29** (FIG. 4) therein is positioned above the circuit board **20** and a contact plate **30** is seated or positioned on the spacer plate **28**. The contact plate **30** has a plurality of contacts **31** (which can be referred to as first or second contacts **31**) adapted, respectively, to make contact with contacts **32** (which can be referred to as second or first contacts **32** and which each comprise two opposed F shaped interleaved conductive strips **33** and **34** on the upper surface **22** of the circuit board **20** as shown in FIG. 2) on the circuit board **20** to close corresponding remote control circuits on the circuit board

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20. Only a few of the contacts **31** and **32** are shown, with exaggerated thickness, in FIG. 4. The holes **29** in the spacer plate **28** are in registry or aligned with the first and second contacts **31** and **32**. The spacer plate **28** also has holes **35** aligned with the holes **36** in the contact plate **30** and each pair of aligned holes **35** and **36** are in registry with a respective one of the light emitting elements **21** on the circuit board **20**. Each one of the LED's **21** protrudes upwardly through the pair of aligned holes **35** and **36**.

As shown in FIG. 3, the first contacts **31** are mounted on an underside **38** of the contact plate **30**.

Positioned over the contact plate **30**, is a transparent or translucent push-button projection fixing, locating or guiding plate **40** which has a plurality of through holes **41** (FIG. 4) which are each aligned with, and positioned over one of, the first contacts **31**. The push-button projection fixing plate **40** is also provided in its lower surface **42** with recesses or grooves **44** (FIGS. 5 and 6), more specifically, generally semi-spherical or partially spherical recesses **44**, each receiving the protruded upper end of one of the corresponding light emitting elements **21**. If desired, a reflective surface **45** having a generally circular extent can be positioned on an upper surface **46** of the fixing plate over each partially spherical recess **44**.

The transparent or translucent, elastomeric or rubber plate **26** is seated on the push-button fixing plate **40**. The elastomeric plate **26** has, on its upper surface **50**, a plurality of upwardly protruded push-buttons **52** including the light actuation push-button **24** which extend upwardly through the holes **16** in the upper case **14** and, on its lower surface **54**, a plurality of depending pressing projections **56**, each aligned with a push-button **52** or the light actuation push-button **24** and extending downwardly through respective ones of the through holes **41** in the push-button projection fixing plate **40**.

The light actuation push-button **24** is disposed at a position at the upper end of the upper case or top housing portion **14** allowing the user to easily find the light actuation push-button **24**. The upper case **14** is disposed over the transparent or translucent elastomeric plate **50**. The upper case **14** is coupled with the lower case **10** by means of screws. The upper case **16** has the plurality of holes **16** through which respective push-buttons **52** and **24** protrude upwardly.

Looking now to FIG. 5, there is illustrated therein two push-button switch assemblies each including a push button **52** the push-button **52** on the left hand side of the figure being the "VOL" down push-button **52** and the push-button **52** on the right hand side of the figure being the "ENTER" push-button **52** as can be seen in FIG. 1. Each switch assembly includes an arrangement of a push-button **52**, a depending pressing projection **56** extending downwardly through a hole **41** in the guiding plate **40**, a first contact **31** and a contact **32**. Each pressing projection **56** is positioned aligned with or in registry with a first contact **31** therebelow which is positioned above a second contact **32** on the circuit board **20**.

As shown in FIG. 5, one LED **21** is each positioned beneath a partially spherical recess or groove **44** in the lower surface **42** of the fixing plate **40**. Also, the openings **41** have a bevel or partially conical surface **60** defining the lower part of each opening **41**. The bevel is shown with an exaggerated angle α to the horizontal which, in an actual embodiment, is approximately 2.75° for facilitating refraction of light into the depending pressing projection **56** of each push-button **52** and of the light actuation push-button **24** as shown in FIG. 6.

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<table>
<tr><td>5</td><td>6</td></tr>
</table>

Also as shown in FIG. 6, each LED 21 is of the type that emits light therefrom in a cone defined by the angled β which is a conical, three dimensional angle of approximately 2π steradians for facilitating entry of light into the transparent or translucent fixing plate 40. From there, the light is reflected at the lower surface 42 and upper surface 46 of the plate 40. If the reflective surface 45 is provided as shown in FIGS. 5 and 6, light from the LED 21 can also be reflected by this light reflecting surface 45 into the transparent or translucent fixing plate 40 to facilitate the dispersion of light into the plate 40 and, as shown in FIG. 6, from the plate 40 into the transparent or translucent plate 26 and into the push-buttons 52 and the depending pressing projections 56 thereof.

OPERATION

The operation of the remote control 8 having the construction described above is described below:

When the remote control 8 is to be manipulated for remote controlling an electric appliance or mechanism in a dark place where symbols and numerals respectively indicated on the push-buttons 52 cannot be distinguished, the user first pushes the light actuation push-button 24 disposed at a position allowing the user to easily find the light actuation button 24. As the light actuation button 24 is pressed down, the pressing projection 56 disposed beneath the light actuation push-button 24 is pressed, thereby causing the first contact 31 disposed beneath the pressed pressing projection 56 to be pressed. Accordingly, the contact 31 comes into contact with the second contact 32 for the lighting circuit for the lighting elements 21 on the circuit board 20, thereby causing the lighting circuit to be closed. At the closed state of the lighting circuit, the lighting elements 21 emit light for several seconds, e.g., 2 to 10 seconds. The emitted light is scattered along the whole lower surface 42 of the push-button fixing plate 40. This light is then outwardly transmitted through the transparent or translucent elastomeric plate 26 and then through the push-buttons 52 and 24 protruding upwardly through the upper case 14. As a result, the user can distinguish the symbols and numerals indicated on the push-buttons 52 by the transmitted light. In this way, it easily is possible to find and push a desired push-button 52 for performing remote control of a desired function in a controlled appliance.

It is preferred that the light emitting elements 21 are activated only for several seconds, as stated above. This is because the battery may be early exhausted if the light emitting elements 21 are continuously activated.

As apparent from the above description, the present invention provides a remote control 8 with light emitting elements 21 that can be energized for a brief time to enable a user easily to find a desired control button 52 which is illuminated by light emitted from the light emitting elements 21 in a dark place or at night to enable a user to effect performance, accurately, a desired function by the controlled appliance.

Although preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions can be made to the remote control 8, without departing from the teachings of the present invention as defined in the accompanying claims.

I claim:

1. A remote control for remote controlling an appliance from a place remote from the place of the appliance, said remote control comprising:

a circuit board having circuits for performing various remote control functions, having a light emitting circuit including at least one light emitting element and having a plurality of spaced apart first contacts, said light emitting circuit including one of said first contacts;

a contact plate disposed over said circuit board and having a plurality of spaced apart second contacts which can individually and selectively be moved against one of said first contacts to close respective ones of said remote control circuits, said plurality of second contacts including a second contact associated with the light emitting circuit which selectively can be moved into contact with one of said first contacts associated with said lighting circuit for closing said light emitting circuit;

said at least one light emitting element being disposed at a predetermined position on said circuit board to protrude upwardly from said circuit board and being connected into said light emitting circuit, said light emitting circuit being constructed and arranged to cause said light emitting element to emit light for several seconds at an activated state that is established when said light emitting circuit is closed by said first and second contacts associated with said light emitting circuit coming into contact with each other;

said contact plate having at least one through hole therethrough adapted to allow light to pass upwardly therethrough from said light emitting element;

a transparent or translucent elastomeric plate having, at an upper surface thereof, a plurality of upwardly protruding buttons corresponding respectively to and positioned over said second contacts which overlie and correspond to said first contacts on said circuit board and having at, a lower surface thereof, a plurality of downwardly extending pressing projections, each located over a second contact; and,

a transparent or translucent button fixing or locating plate having a plurality of through holes which receive and serve to fix, locate and guide each downwardly extending pressing projection against one of said second contacts to cause said second contact to come into aligned contact with its associated first contact on said circuit board to ensure accurate closing of each of said remote control circuits, whereby,

when said button associated with said first and second contacts associated with said light emitting circuit is depressed to bring it into contact with its associated second contact, said light emitting circuit is closed and said light emitting element projects light against said transparent or translucent fixing plate which scatters light emitted from said light emitting element so that said scattered light is spread along all of said transparent or translucent fixing plate and into said buttons thereby illuminating same to a user of the remote control.

2. The remote control of claim 1 wherein said transparent or translucent button fixing plate is provided at a lower surface thereof with at least one recess for receiving an upper end of said light emitting element protruding upwardly through an associated aligned through hole in said contact plate.

3. The remote control of claim 2 wherein said lighting elements include at least six (6) light emitting diodes.

4. A hand held, battery operated remote control for controlling an appliance from a remote location, said remote control comprising: a housing having openings through an

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upper wall thereof; a plurality of transparent or translucent push-buttons each extending upwardly through one of said openings; one of said push-buttons being a light actuation button; a plurality of switch means each associated with one of said push-buttons; and a light emitting circuit located inside said housing and including at least one light emitting element positioned in said housing at a location not under a push button, light dispersing means for illuminating one or more of said push-buttons with light from said at least one light emitting element, and circuit means for maintaining said light emitting circuit activated for a short period of time after depression of said light actuation button.

5. The remote control of claim **4** including a circuit board having said light emitting circuit situated thereon and being mounted in said housing.

6. The remote control of claim **5** including a plurality of light emitting elements mounted at spaced apart locations on said circuit board.

7. The remote control of claim **6** wherein said plurality of light emitting elements include at least six (6) light emitting diodes.

8. The remote control of claim **5** including a transparent or translucent elastomeric plate having said push-buttons formed therein.

9. The remote control of claim **8** wherein said light dispersing means includes a transparent or translucent button fixing plate positioned beneath said elastomeric plate and having a plurality of holes therein, each locating beneath one of said push-buttons.

10. The remote control of claim **9** wherein said fixing plate has a lower surface with at least one recess therein and said light emitting element is mounted on said circuit board in a position facing said recess.

11. The remote control of claim **10** wherein said light emitting element emits light in a conical envelope which has an apex angle β of approximately 2π steradians.

12. The remote control of claim **9** wherein each of said holes in said button fixing plate not only extends through

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said button fixing plate but also has a beveled or frusto-conical surface at the lower side thereof in said button fixing plate.

13. The remote control of claim **12** wherein said frusto-conical surface is defined by an angle α to the horizontal of approximately 2.75°.

14. The remote control of claim **5** including a contact plate positioned above said circuit board in said housing and having a plurality of spaced apart first contacts on a lower surface thereof and said circuit board having a plurality of second contacts on an upper surface thereof, each second contact being aligned with one of said first contacts, each first contact being aligned with one of said push-buttons, and each pair of aligned first and second contacts forming part of one of said switch means.

15. The remote control of claim **5** including a contact plate positioned above said circuit board in said housing and having a plurality of spaced apart first contacts on a lower surface thereof and said circuit board having a plurality of second contacts on an upper surface thereof, each second contact being aligned with one of said first contacts, each first contact being aligned with one of said push-buttons, and each pair of aligned first and second contacts forming part of one of said switch means and an insulating, spacer plate situated above said circuit board and between said circuit board and said contact plate.

16. The remote control of claim **15** including a transparent or translucent elastomeric plate having said push-buttons formed therein, a transparent or translucent button fixing plate positioned beneath said elastomeric plate and having a plurality of holes therein, each located beneath one of said push-buttons, and a projection depending from each push-button and adapted to extend through one of said holes in said fixing plate and against one of said first contacts on said contact plate.

* * * * *

US005614906A

United States Patent [19]

Hayes et al.

[11] **Patent Number:** **5,614,906**

[45] **Date of Patent:** **Mar. 25, 1997**

[54] **METHOD FOR SELECTING A REMOTE CONTROL COMMAND SET**

[75] Inventors: **Patrick H. Hayes**, Mission Viejo; **Kimthoa T. Nguyen**, Yorba Linda, both of Calif.

[73] Assignee: **Universal Electronics Inc.**, Twinsburg, Ohio

[21] Appl. No.: **636,666**

[22] Filed: **Apr. 23, 1996**

[51] **Int. Cl.^{6}** **G08C 19/12**

[52] **U.S. Cl.** **341/176**; 340/825.37; 340/825.69; 340/825.72; 359/148; 379/102

[58] **Field of Search** 341/176, 173, 341/174, 175, 23; 348/734; 359/148; 364/709.14, 709.15, 709.16; 379/102; 340/825.37, 825.69, 825.72

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,703,359	10/1987	Rumbolt et al.	340/825.69
4,746,919	5/1988	Reitmeier	340/825.72
4,825,209	4/1989	Sasaki et al.	340/825.37
4,959,810	9/1990	Darbee et al.	340/825.69
4,999,622	3/1991	Amano et al.	341/176
5,420,573	5/1995	Tanaka et al.	341/176
5,453,738	9/1995	Zirkl et al.	340/825.72
5,485,149	1/1996	Takiguchi et al.	359/148
5,537,463	7/1996	Escobosa et al.	379/102

Primary Examiner—Jeffery Hofsass
Assistant Examiner—Andrew Hill
Attorney, Agent, or Firm—Thomas R. Vigil; Gary Jarosik; Mark R. Galis

[57] **ABSTRACT**

A method for selecting a command set from a group of command sets stored in the remote control. Each remote control command set includes a set of commands for operating at least one of various remotely controllable devices. A command, whose effect is observable in the remotely controlled device is assigned to one of the user actuated keys. The keys are pressed one by one until the user observes the desired effect on the remotely controlled device. The user then signals the remote control to exit the select procedure with the remote control setting the remote control to transmit future commands from the command set including the last transmitted effects observable command having the observed desired effect.

16 Claims, 6 Drawing Sheets

A001021

FIG. 1

FIG. 2

28

32   30   36

| OSCILLATOR CIRCUIT | CONTROL CIRCUIT | KEYPAD CIRCUIT |

MICROPROCESSOR

ROM   RAM   42

| RESET CIRCUIT | | EXTERNAL DATA INPUT CIRCUIT |

44   46

34   38

OSCILLATOR CIRCUIT

40
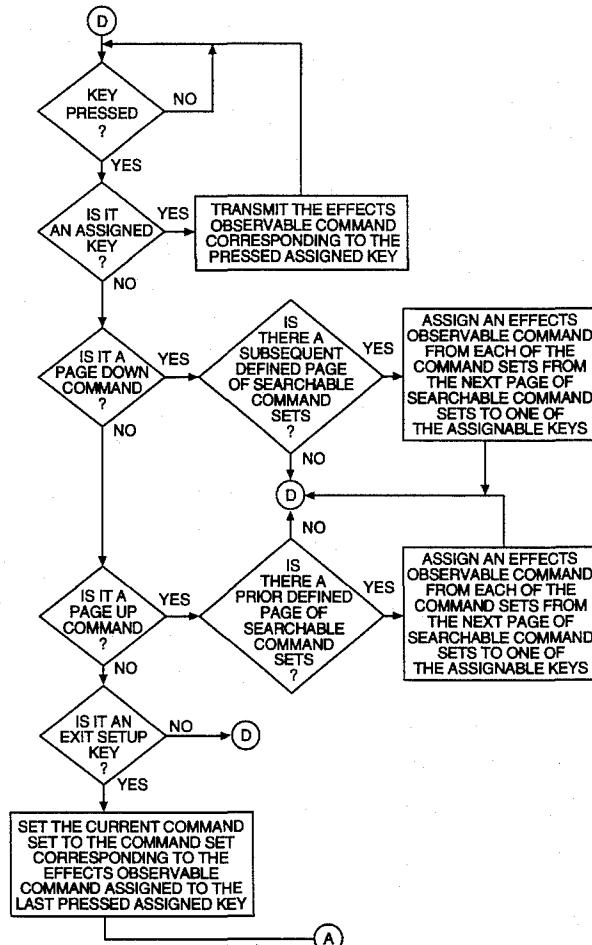
FIG. 3A

U.S. Patent   Mar. 25, 1997   Sheet 4 of 6   **5,614,906**

FIG. 3B

(B)

↓

IS THE FUNCTION CODE A DOWNLOAD CODE ? —YES→ **RECEIVE ONE OR MORE COMMAND SETS VIA THE EXTERNAL DATA INPUT** → **SET THE SEARCHABLE COMMAND SETS TO THE COMMAND SETS RECEIVED VIA THE EXTERNAL DATA INPUT**

NO ↓

↓ (from RECEIVED box) (C)

IS THE FUNCTION CODE A SEARCH CODE ? —YES→ **SET THE SEARCHABLE COMMAND SETS TO THE COMMAND SETS STORED IN THE REMOTE CONTROL**

NO ↓

(A)   (C)

FIG. 3C

(C)

↓

ARE THE NUMBER OF SEARCHABLE COMMAND SETS GREATER THAN THE NUMBER OF ASSIGNABLE KEYS ? —YES→ **DEFINE MULTIPLE PAGES OF SEARCHABLE COMMAND SETS WITH THE NUMBER OF COMMAND SETS IN EACH PAGE NO GREATER THAN THE NUMBER OF ASSIGNABLE KEYS**

NO ↓   ↓

ASSIGN AN EFFECTS OBSERVABLE COMMAND FROM EACH OF THE SEARCHABLE COMMAND SETS TO ONE OF THE ASSIGNABLE KEYS   **ASSIGN AN EFFECTS OBSERVABLE COMMAND FROM EACH OF THE COMMAND SETS FROM THE FIRST PAGE OF SEARCHABLE COMMAND SETS TO ONE OF THE ASSIGNABLE KEYS**

↓

(D)

FIG. 3D

(D)

KEY PRESSED ? — NO

YES

IS IT AN ASSIGNED KEY ? — YES → TRANSMIT THE EFFECTS OBSERVABLE COMMAND CORRESPONDING TO THE PRESSED ASSIGNED KEY

NO

IS IT A PAGE DOWN COMMAND ? — YES → IS THERE A SUBSEQUENT DEFINED PAGE OF SEARCHABLE COMMAND SETS ? — YES → ASSIGN AN EFFECTS OBSERVABLE COMMAND FROM EACH OF THE COMMAND SETS FROM THE NEXT PAGE OF SEARCHABLE COMMAND SETS TO ONE OF THE ASSIGNABLE KEYS

NO

NO

(D)

NO

IS IT A PAGE UP COMMAND ? — YES → IS THERE A PRIOR DEFINED PAGE OF SEARCHABLE COMMAND SETS ? — YES → ASSIGN AN EFFECTS OBSERVABLE COMMAND FROM EACH OF THE COMMAND SETS FROM THE NEXT PAGE OF SEARCHABLE COMMAND SETS TO ONE OF THE ASSIGNABLE KEYS

NO

IS IT AN EXIT SETUP KEY ? — NO → (D)

YES

SET THE CURRENT COMMAND SET TO THE COMMAND SET CORRESPONDING TO THE EFFECTS OBSERVABLE COMMAND ASSIGNED TO THE LAST PRESSED ASSIGNED KEY

(A)

FIG. 4

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METHOD FOR SELECTING A REMOTE CONTROL COMMAND SET

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method for selecting a remote control command set from a group of multiple command sets stored in a remote control, for controlling various remotely controllable electronic devices.

2. Description of the Related Art Including Information Disclosed Under 37 CFR §§ 1.97–1.99

Heretofore, various systems for providing methods of selecting a remote control command set from a group of multiple command sets have been proposed. Several examples of analogous and non-analogous methods are disclosed in the following U.S. Patents:

	Patentee
U.S. Pat. No.	
4,703,359	Rumbolt et al.
4,959,810	Darbee et al.
5,485,149	Takiguchi et al.
German Patent Publications:	
DE 33 13 493 A1	Telefunken

The Rumbolt et al., U.S. Pat. No. 4,703,359 discloses a method for adapting a remote control to generate a remote command signal having the appropriate signal structure for controlling a selected one of a plurality of electronic devices. Once the method is initiated, the remote control automatically cycles through the entire list of different format command lists stored within the remote control's internal memory, transmitting a test command to the desired device to be controlled until the user interrupts the cycle. Interrupting the cycle of test commands causes the remote control to transmit future commands using the signal structure of the last test command transmitted prior to interrupting the cycle.

The Darbee et al., U.S. Pat. No. 4,959,810 discloses a universal remote control system that provides for two methods for selecting a remote control command set.

The first method is a step and set procedure in which the list of command sets stored in the remote control are stepped through both forward and backwards allowing a test command from the currently selected command set to be transmitted. The user observes the effects of the test command to determine if the currently selected command set is compatible with the device the user is wanting to control. When the user finds a command set compatible with the device to be controlled, the user exits the procedure with the remote control set to the compatible command set.

The second method is a direct entry—quick set procedure in which the user looks up the make and model of the of the device to be controlled from a printed list of devices. The user then directly inputs a corresponding code associated with the make and model of the device to be controlled to index the proper command set from the remote control's internal command set library.

The Takiguchi et al., U.S. Pat. No. 5,485,149 discloses a method for selecting a set of remote control signals from multiple remote control signal groups, where each group contains multiple sets of remote control signals. Each remote control signal group is assigned to one of the operating keys.

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Upon entering a select setting mode, the particular set of remote control signals within one of the signal groups is selected by the number of times the assigned operating key is pressed. A single keypress will select the first set of remote control signals within the remote control signal group assigned to the pressed key. Pressing the same key a second time will select the second set of remote control signals within the assigned remote control signal group. Similarly, subsequent key presses of the same key will select subsequent sets of remote control signals.

The Telefunken, German published patent application DE 33 13 493 A1 discloses a remote control having a table containing multiple columns of control signals each column containing the code signals for operating a particular device and a mechanism for selecting the appropriate column of control signals.

The remote control provides for the selection of the appropriate column of control signals by automatically cycling through the multiple columns of control signals, transmitting a trial command, and observing the effect of the trial command on the device to be remotely operated. When the desired result is observed, the user signals the remote control that a successful command has been transmitted. The remote control then eliminates from consideration all columns of control signals that do not contain the matched successful trial command. If more than one column of control signals match the successful trial command, the remote control repeats the above procedure using a different trial command and cycling through only the remaining columns of control signals until all columns of command signals have been eliminated except one.

SUMMARY OF THE INVENTION

According to the present invention there is provided a method for selecting a remote control command set from a group of multiple command sets stored in a remote control, for controlling various remotely controllable electronic devices. The method includes assigning multiple effects observable commands (e.g. a "power off" command) from a group of command sets stored in the remote control to multiple user actuated switches or keys of the remote control.

The user then actuates the switches or keys, one at a time, with the corresponding assigned effects observable command being transmitted. The user continues to actuate keys until the user observes the remotely controlled device responding properly to the transmitted command. The user then terminates the selection procedure with the remote control setting the active command set to the command set from which the successful effects observable command was assigned.

By assigning a single command set to a single user actuated key, the negative effects of a user key actuation that results in a double key actuation or not registering due to failure to fully actuate the key is minimized. If the user suspects the key was not fully actuated, the user can repeat that particular key actuation. If the user inadvertently causes the remote to detect a double key actuation, the remote control merely sends the effects observable command from the assigned command set twice. If the user wishes to actuate a particular key several times in order to confirm its effect on the responding device, he may do so at any point during the process without affecting the process.

The command sets stored in the remote control can be permanently stored in the remote control at the time of

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manufacture or downloaded from an external source. The ability to download command sets from an external source allows the remote control to provide remote control functionality with future devices whose particular transmission protocol or commands have not yet been determined.

The method for selecting a remote control command set from a group of multiple command sets stored in a remote control, further provides for inputting a criteria code for limiting or filtering the list of command sets to be searched through to those command sets that work with devices meeting a particular criteria. In this way, the entire list of command sets do not need to be searched through. Similarly it does not require the user to know all the details about a particular device in order to determine and set the appropriate command set.

Where the number of command sets to be searched through exceeds the number of keys with which the effects observable commands are assigned, the method additionally provides for the ability to page through sub-groups of command sets. Each subgroup being no larger than the number of assignable keys.

Where a remote control provides for multiple modes, each mode providing for the remote operation of a different device (i.e. TV, VCR, cable box, etc.), a different command set can be selected for each of the available modes.

Other objects and advantages of the present application will be apparent from the detailed description and drawings which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the top face of a remote control incorporating the method for selecting a remote control command set from a group of multiple command sets stored in the remote control.

FIG. 2 is a block diagram of the internal circuitry of the remote control shown in FIG. 1.

FIGS. 3A, 3B, 3C and 3D are each portions of a flow chart that together provide instructions for assisting in the control of the remote control with particular emphasis on the steps that provide for the method of selecting a remote control command set from a group of multiple command sets stored in the remote control.

FIG. 4 is schematic layout of a portion of a BRAND TABLE and of a list of DEVICE ID DATA stored in a memory (RAM) of a microprocessor shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in greater detail, there is illustrated in FIG. 1 a plan view of the top face of a remote control 10 incorporating the method for selecting a remote control command set from a group of multiple command sets stored in the remote control.

The remote control includes a set of user actuated keys 12, including a power key 14, numeric keys 16, mode keys 18, a magic key 20, and channel up and channel down keys 22. The remote control 10 further includes a visual LED 24 and an infra-red LED (not shown), located at the front 26 of the remote control 10.

FIG. 2 is a block diagram of the internal circuitry 28 of the remote control shown in FIG. 1. The internal circuitry 28 is similar to the circuitry described in *Escobosa* et al., U.S. Ser. No. 08/251,336, filed May 31, 1994, now U.S. Pat. No.

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5,537,463, whose specification is incorporated herein by reference.

The internal circuitry 28 includes a control circuit 30, an oscillator circuit 32, a reset circuit 34, a key pad circuit 36, an external data input circuit 38, and an LED driver circuit 40.

The control circuit 30 monitors and controls the overall functioning of the remote control 10. In a preferred embodiment it incorporates a microprocessor 42, with associated semiconductor memory in the form of ROM 44 and/or RAM 46. The semiconductor memory is used to store both program operating instructions and program data for assisting in the control of the remote control 10.

The oscillator circuit 32 provides a clocking signal to the control circuit 30. The reset circuit 34 provides a reset signal to the control circuit when the internal circuitry 28 is initially powered up. The key pad circuit 36 incorporates the user actuated keys 12 and provides circuitry in conjunction with the control circuit 30 for decoding which one of the user actuated keys 12 has been actuated.

The external data input circuit 38 receives data from a source external to the remote control 10. The particular circuitry can take the form of any one of many traditional forms of communication, whether wired or wireless. In one preferred embodiment the external data communication is accomplished by a magnetic modem similar to the one described in the Escobosa application, U.S. Ser. No. 08/251,336, filed May 31, 1994, referred to above.

The LED driver circuit 40 is coupled to the control circuit 30 and incorporates the visual LED 24 and the infra-red LED (not shown) located at the front 26 of the remote control 10 and provides the LEDs with driving power in response to signals received from the control circuit 30. The visual LED 24 provides the user with visual feedback concerning the remote control's 10 activity. The infra-red LED provides the signalling capability for sending the remote control signals to the devices to be controlled.

FIGS. 3A, 3B, 3C and 3D are each portions of a flow chart that together provide instructions for assisting in the control of the remote control with particular emphasis on the steps that provide for the method of selecting a remote control command set from a group of multiple command sets stored in the remote control.

FIG. 3A shows the starting point of the instructions to be executed by the microprocessor 42 in controlling the remote control 10. The flow chart begins by waiting for an interrupt or an indication that a key or switch 12 has been pressed or actuated. Upon actuation of a key or switch 12, a determination is made as to which key has been pressed.

If a mode key 18 is pressed the remote control 10 sets the current command set from which commands will be transmitted to the command set chosen for the selected mode. The mode keys 18 preferably include separate mode keys 18 for a TV, a VCR, a Cable Box, as well as any other device for which an infra-red remote control transmitter could be used to remotely control the device.

If a command key is pressed, the remote control 10 transmits the particular operating command associated with the pressed command key from the currently selected command set.

If an enter setup key is pressed the remote control 10 enters a setup mode used to configure the remote control 10. In the preferred embodiment the enter setup key is equivalent to the magic key 20, however it can take any one of various forms including a slider switch or a combination of key presses.

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Upon entering the setup mode, the remote control **10** waits until it receives a set up code. If the setup code is a setup function code, the execution of operating instructions of the remote control **10** branches to FIG. **3B** to perform instructions to determine which function code has been requested to be performed.

If the setup code is a criteria code, indicating a particular subset of command code sets, the remote control sets the searchable command sets to the command sets meeting the received criteria and branches the execution of instructions to FIG. **3C** to perform instructions to select a new command set for the currently active mode.

The criteria code allows the remote control to restrict the number of searchable command sets to only those command sets used with devices meeting a particular criteria and\or to determine a different order of assigning the effects observable commands.

Preferably the effects observable commands will be assigned to the user actuated keys in order of decreasing popularity. However a command set that is not very popular when one considers the entire list of stored command sets used for operating a television, may be the most popular command set used for operating a television manufactured by a particular manufacturer. The use of a criteria code representing a particular manufacturer by the user can be used to establish a different assignment order based on the popularity of command sets following the indicated criteria.

Examples of different possible criteria include codes for different manufacturers, codes for equipment manufactured or purchased between a specified time period, devices sold through a particular retail outlet, etc.

Additionally in some embodiments it is possible to allow for the entry of multiple criteria in order to further isolate the proper command set for operating a particular device.

If the setup code is neither a function code nor a setup code, it is assumed the user inadvertently entered the setup mode and the execution of the operating instructions of the remote control **10** branches to the start of the instructions in FIG. **3A**.

FIG. **3B** shows the program steps performed when a function code is received after entering the setup mode. First a determination is made to identify which function is being requested to be executed. If the function code is determined to be a download code, the remote control executes a procedure to receive one or more command sets via the external data input. The searchable subset of command sets are defined to include the received command sets and the execution of the operating instructions branches to FIG. **3C**.

Similarly, an alternative embodiment can allow the received command sets to supplement the command sets previously stored in the remote control **10**.

In the embodiment disclosed in FIGS. **3A** through **3D** the remote control enters a command set selection procedure after downloading the received data, however it is not necessary for the selection procedure to be entered immediately after downloading of the received data, but can be delayed until the user chooses. Similarly, the data received does not necessarily have to be one or more command sets, but can include updates to already stored command sets or other related data.

If the function code is a search code, the searchable set of commands is defined to include the command sets stored in the remote control without first inputting a criteria code or downloading command sets. This allows the user to directly enter the procedure to select the new command set without first entering a criteria code or performing another function.

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FIGS. **3C** and **3D** shows the program steps for selecting the new command set from the list of searchable command sets. Initially, as shown in FIG. **3C** a determination is made whether the number of searchable command sets exceeds the number of assignable user actuated keys or switches.

If the number of searchable command sets is greater than the number of assignable user actuated keys or switches the searchable command sets are broken up into multiple pages of command sets no greater in size than the number of assignable user actuated keys that can be paged through using the channel up and channel down keys **22**. The effects observable commands from the currently selected page, initially the first page, of command sets is assigned to the assignable user actuated keys.

If the number of searchable command sets is equal to or less than the number of assignable user actuated keys or switches, the effects observable commands from the searchable command sets, forming a single page of command sets, are assigned to the assignable user actuated keys.

After the effects observable commands for the currently selected page have been assigned, the remote control **10** waits for a key to be pressed. When a key press has been detected the remote control **10** determines if the key pressed is an assignable user actuated key, a key which has had an effects observable command assigned to it. If it is then the remote control transmits the assigned effects observable command (e.g., a "power off" command) to the device to be remotely controlled and loops back to wait for another key press. The user observes the device to be remotely controlled for a visual indication of a compatible command.

In the preferred embodiment the assignable user actuated keys include the power key **14** and the numeric keys **16**. The assignable user actuated keys are assigned in the order of the power key **14** first, followed by the numeric keys **16** in order starting with the "one" key and ending with the "zero" key. Additionally the preferred effects observable command is a power off command.

If the key pressed is a page down command (i.e. a channel down key **22**), and a subsequent page of command sets is defined. Then the remote control **10** reassigns an effects observable command from each of the command sets from the subsequent page of command sets to the assignable user actuated keys and loops back to wait for another key press.

If the key pressed is a page up command (i.e. a channel up key **22**), and a prior page of command sets is defined, then the remote control reassigns an effects observable command from each of the command sets from the prior page of command sets to the assignable user actuated keys and loops back to wait for another key press.

If the key pressed is an exit setup key (i.e. a magic key **20**), then the remote control **10** sets the current command set for the currently selected mode to the command set corresponding to the effects observable command assigned to the last pressed assigned key. Typically the user exits the setup procedure when the user observes the desired effect on the device to be controlled by the remote control **10**, indicating that a compatible command set has been located.

In this way a method for selecting a compatible command set from a library of multiple command sets can be realized. Similarly different command sets can be selected for each of the different device modes by selecting the mode key **18** corresponding to the desired mode prior to entering the setup procedure.

Often times, a plurality of brands of electronic devices, e.g., television sets may share a device entry code. For example, the Panasonic code, **035**, is also the entry code for

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a private labelled television set sold by Montgomery Wards. This is illustrated in FIG. 4.

Additionally, as shown in FIG. 4, the priority order may be different from brand name to brand name, even though they use the same device entry code. For example the Sony number 1 code is 033, but this device entry code is only the Wards number 2 code.

From the foregoing description, it will be apparent that the method for selecting a remote control command set from a group of multiple command sets stored in a remote control, for controlling various remotely controllable electronic devices of the present invention has a number of advantages, some of which have been described above and others of which are inherent in the method of the invention. Also it will be understood that modifications can be made to the method for selecting a remote control command set described above without departing from the teachings of the invention.

I claim:

1. A method for selecting an appropriate one of a plurality of command sets stored in a remote control having a plurality of assignable user actuated switches or keys for controlling a remotely controllable electronic device, comprising the steps of:

(a) assigning an effects observable command from each of said plurality of command sets to one of said plurality of assignable user actuated switches or keys, each assigned, effects observable command to be transmitted when the corresponding one of the assignable user actuated switches or keys is actuated;

(b) actuating sequentially and individually each one of the plurality of assignable user actuated switches or keys, to individually transmit each assigned effects observable command until the proper effect is observed;

(c) halting the actuating of the plurality of assignable user actuated switches or keys; and

(d) setting the remote control to transmit future remote control commands from the command set containing the last transmitted effects observable command.

2. The method of claim 1, further comprising the step of receiving the plurality of command sets from an external source prior to the step of assigning an effects observable command.

3. The method of claim 2, wherein said external source communicates with the remote control via a wireless signal transmission.

4. The method of claim 2, wherein said external source communicates with the remote control via a wired signal transmission.

5. The method of claim 2, wherein said external source communicates with the remote control via a magnetic modem coupled to a telephone handset.

6. The method of claim 1, further comprising the step of receiving a code input from the user and wherein said code input is used to identify a subset of command sets meeting a particular criteria, from which said effects observable commands are assigned from.

7. The method of claim 6, wherein said particular criteria refer to command sets which control electronic devices manufactured by a specific manufacturer.

8. The method of claim 6, wherein said particular criteria refer to command sets which control electronic devices manufactured within a specific time period.

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9. The method of claim 6, wherein said particular criteria refer to command sets which control electronic devices sold through a particular retail outlet.

10. The method of claim 1, wherein said effects observable command is a power off command.

11. The method of claim 1, wherein said plurality of assignable user actuated switches or keys include a power key and numeric keys.

12. The method of claim 1, wherein said remote control further includes a plurality of user actuated mode keys for selecting one of a plurality of modes and said method further includes the step of selecting one of the plurality of modes prior to the step of assigning an effects observable command, such that, the method for selecting an appropriate one of a plurality of command sets can be performed to separately set a different command set for each mode.

13. The method of claim 1, wherein said remote control further includes a page down user actuated key and a page up user actuated key and, when the number of command sets exceed the number of assignable user actuated switches or keys, said method further includes the steps of: assigning an effects observable command from each of said plurality of command sets in a subsequent group of command sets to one of said plurality of assignable user actuated switches or keys, when a page down user actuated key is actuated; and assigning an effects observable command from each of said plurality of command sets in a prior group of command sets to one of said plurality of assignable user actuated switches or keys, when a page up user actuated key is actuated.

14. The method of claim 1, wherein the order of said effects observable commands from said plurality of command sets is assigned to said plurality of assignable user actuated switches or keys based upon decreasing popularity of usage of each of said command sets.

15. The method of claim 14, further comprising the step of receiving a code input from the user and wherein said code input indicates a particular criteria and is used to further determine the order said effects observable commands are assigned to said plurality of assignable user actuated switches or keys based upon decreasing popularity of usage of each of said command sets conforming to said criteria.

16. An apparatus for selecting an appropriate one of a plurality of command sets stored in a remote control having a plurality of assignable user actuated switches or keys for controlling a remotely controllable electronic device, comprising:

means for assigning an effects observable command from each of the plurality of command sets to one of said plurality of assignable user actuated switches or keys;

means for transmitting said effects observable command when the corresponding one of said plurality of assignable user actuated switches or keys is actuated;

means for indicating the halting of the actuation of the plurality of assignable user actuated switches or keys; and

means for setting the remote control to transmit future remote control commands from the command set containing the last transmitted effects observable command.

* * * * *

US006587067B2

(12) **United States Patent**
Darbee et al.

(10) **Patent No.:** **US 6,587,067 B2**
(45) **Date of Patent:** **Jul. 1, 2003**

(54) **UNIVERSAL REMOTE CONTROL WITH MACRO COMMAND CAPABILITIES**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 64 days.

(21) Appl. No.: **09/791,354**

(22) Filed: **Feb. 23, 2001**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. 09/408,729, filed on Sep. 29, 1999, now Pat. No. 6,195,033, which is a continuation-in-part of application No. 07/990,854, filed on Dec. 11, 1992, now Pat. No. 6,014,092, which is a continuation-in-part of application No. 07/913,523, filed on Jul. 14, 1992, now abandoned, which is a continuation-in-part of application No. 07/586,957, filed on Sep. 24, 1990, now abandoned, which is a continuation-in-part of application No. 07/127,999, filed on Dec. 2, 1987, now Pat. No. 4,959,810, which is a continuation-in-part of application No. 09/109,336, filed on Oct. 14, 1987, now abandoned.

(51) Int. Cl.⁷ **H04L 17/02**
(52) U.S. Cl. **341/176**; 341/173; 345/171; 345/169; 359/146; 359/148
(58) Field of Search 341/173, 176; 348/734; 340/825.52, 825.72; 359/146, 148; 345/168, 169, 172

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Primary Examiner—Michael Horabik
Assistant Examiner—Albert K. Wong
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(57) **ABSTRACT**

A universal remote control comprising a keyboard having a plurality of pushbuttons including a macro pushbutton and a library of codes and data for use in transmitting operating commands to a plurality of different home appliances of different manufacturers. Instructions within the remote control are used to match the universal remote control to a plurality of different home appliances of different manufacturers such that selected codes and data from the library are used to transmit operating commands to the matched home appliances in response to activation of selected pushbuttons of the keyboard. The instructions are also used to assign to the macro pushbutton a subset of the selected codes and data from the library whereafter activation of the macro pushbutton causes the universal remote control to use the subset of selected codes and data from the library to transmit operating commands to one or more of the matched home appliances.

6 Claims, 17 Drawing Sheets

SETTING A "DO" COMMAND MACRO
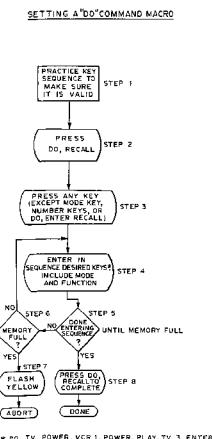
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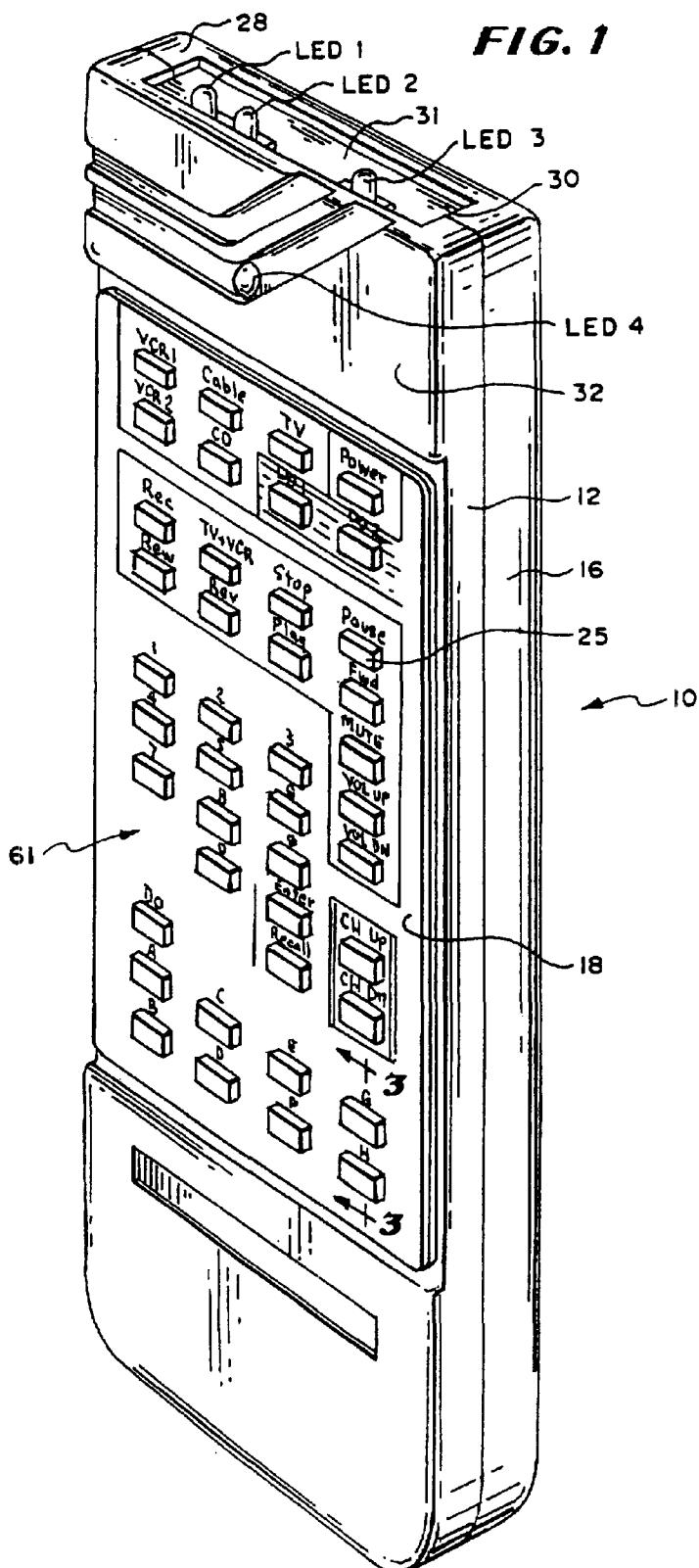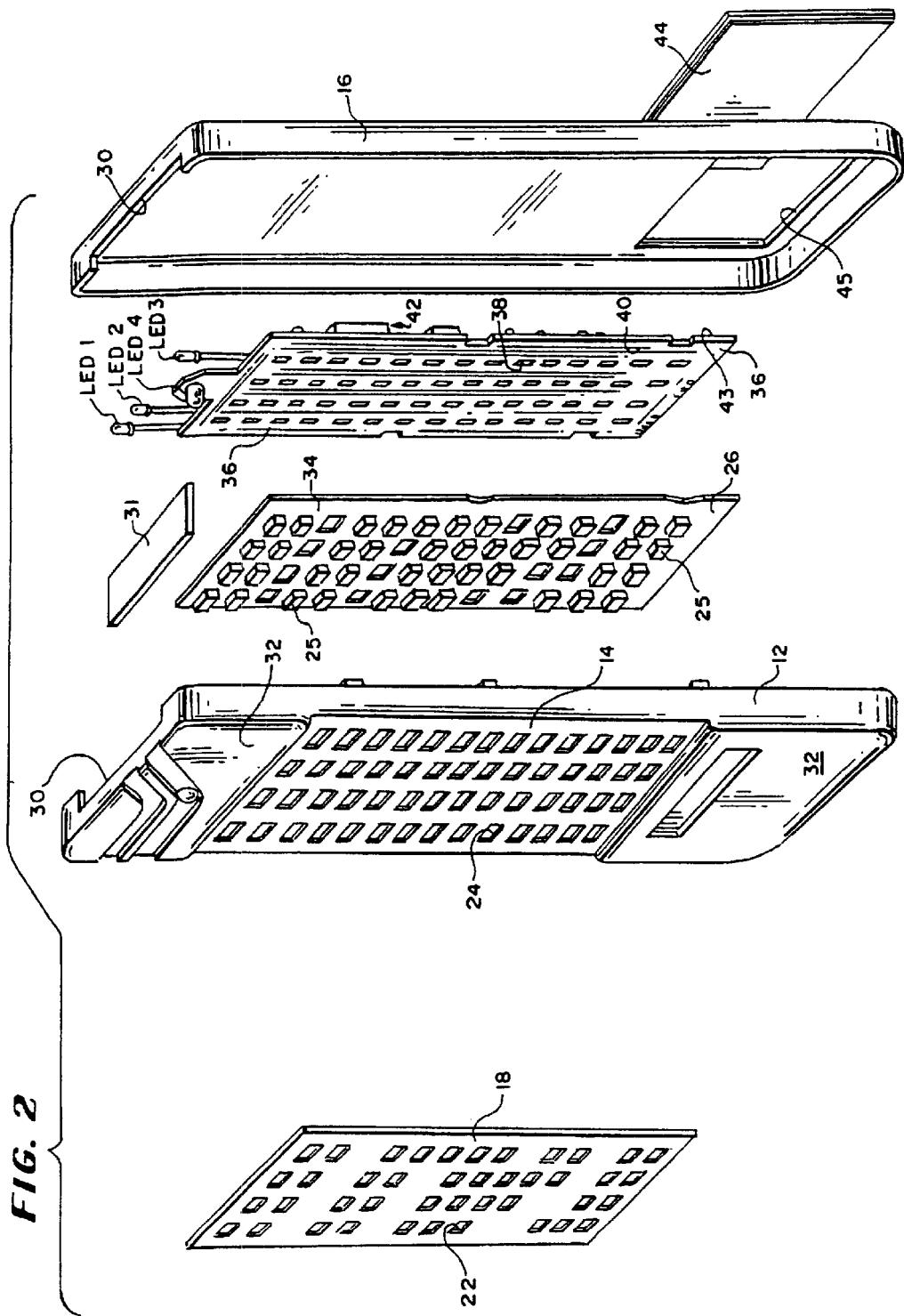
FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

INFRARED
LIGHT-
EMITTING
DIODE (x3)

⊕ ← 8-BIT MICROPROCESSOR CPU 56 — RANDOM ACCESS MEMORY 54

SERIAL
I/O

60

4 x 14 KEYBOARD 61

LITHIUM BATTERY 52

4 x "AAA" BATTERY 46

FIG. 10

μP — 200

202

204

54

LED 3

LED 4

LED 2

LED 1

56

52

58

46

12

36

45

FIG. 9A

FIG. 9B

FIG. 11
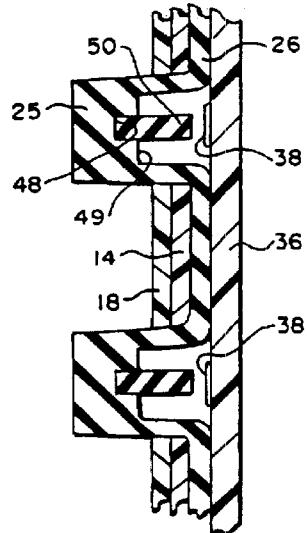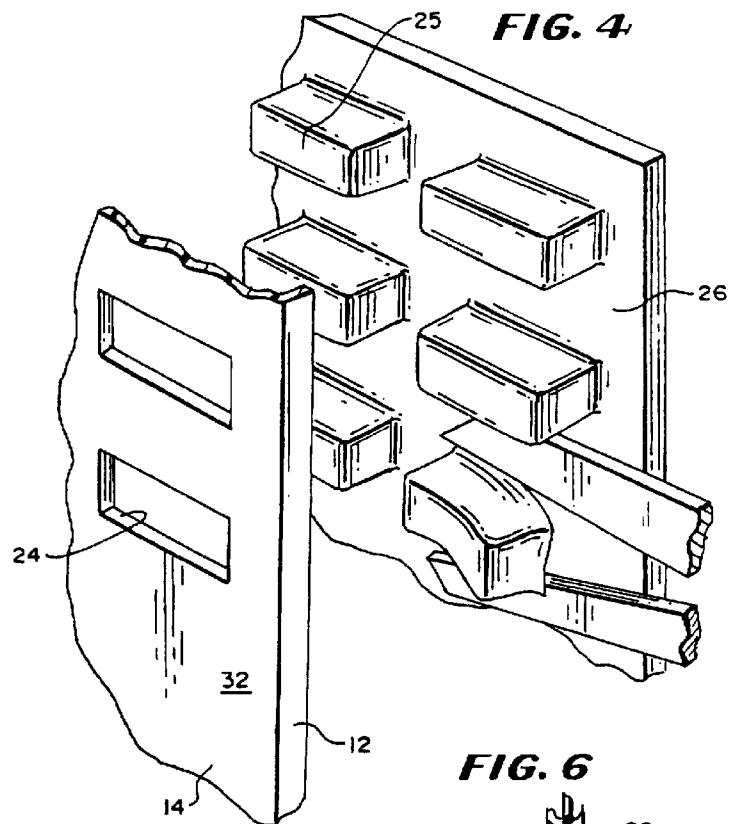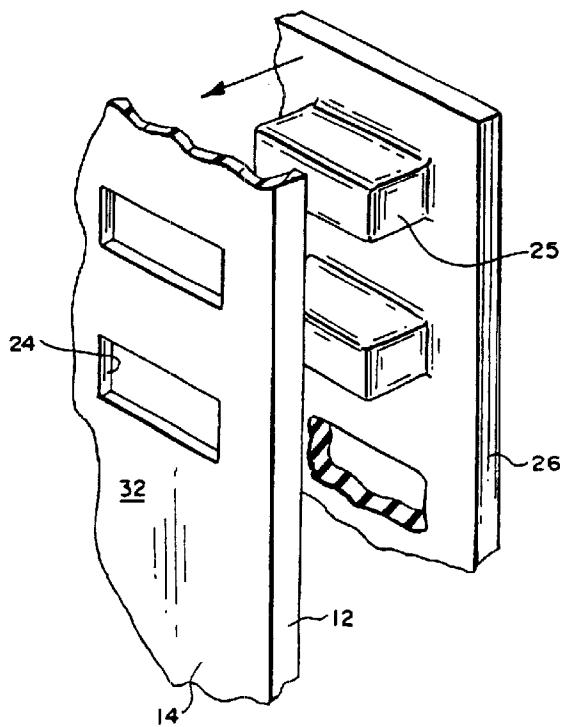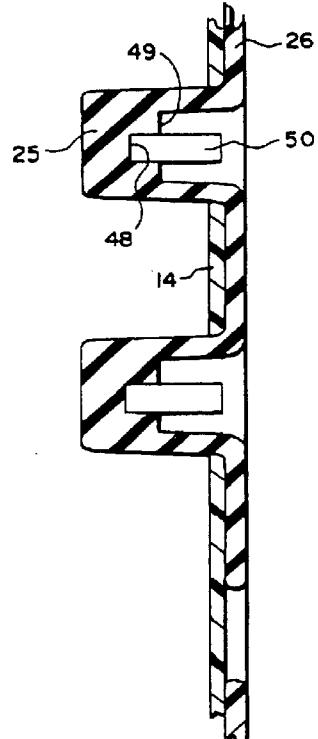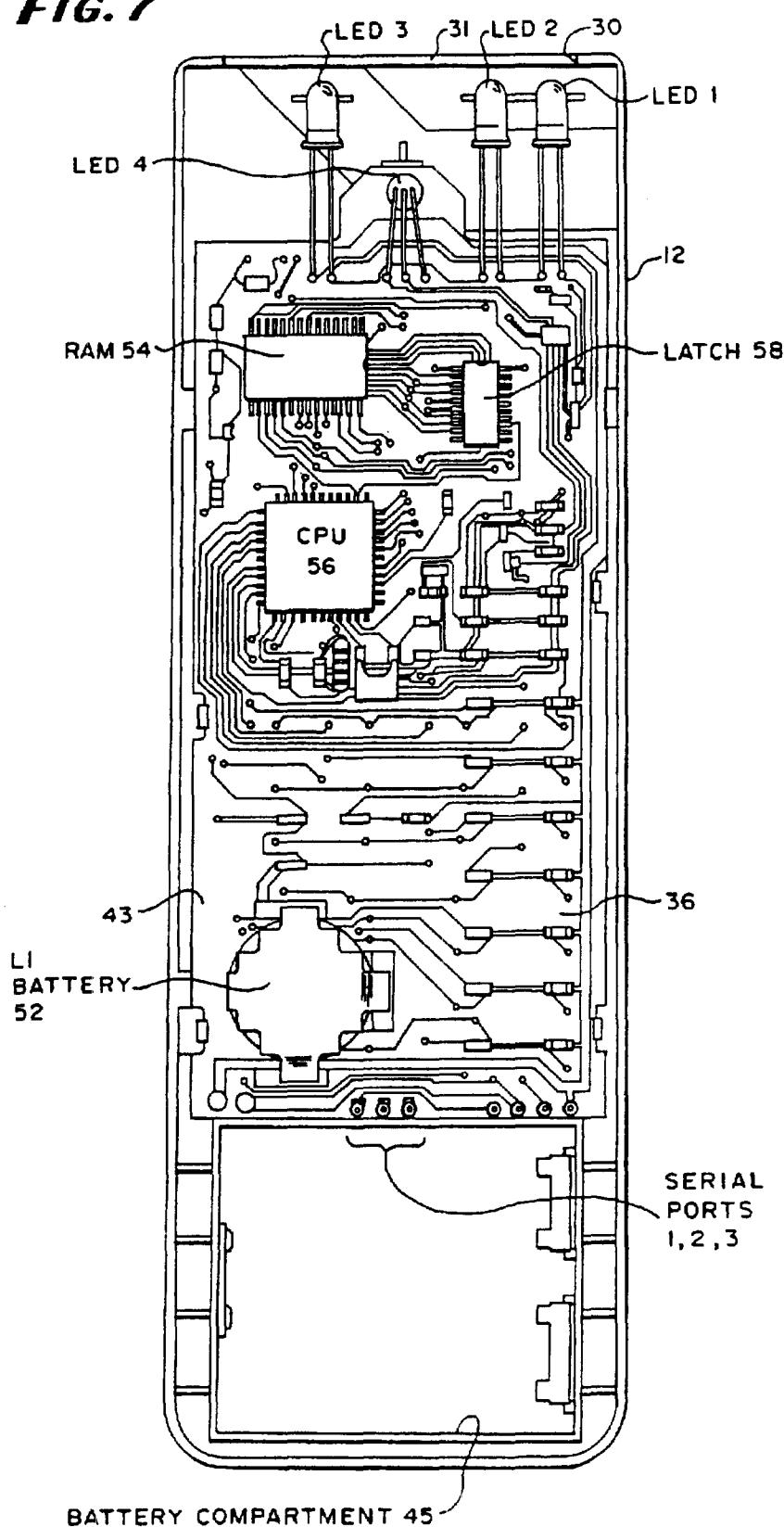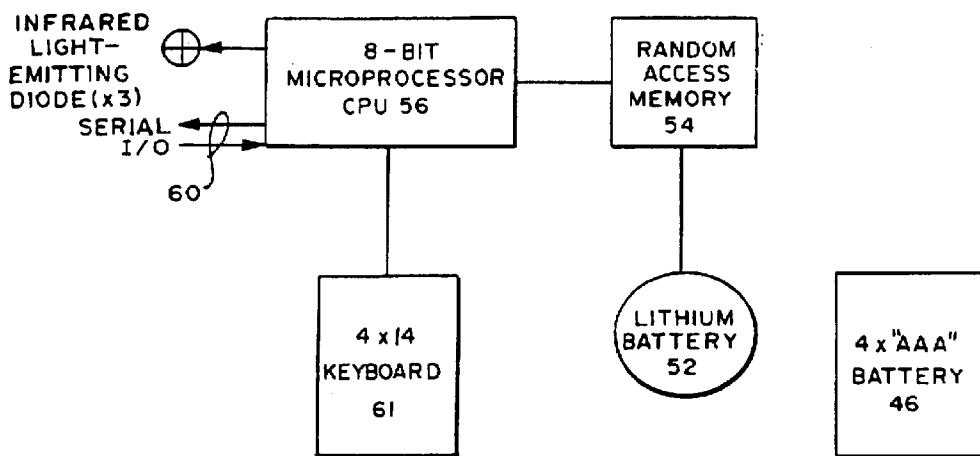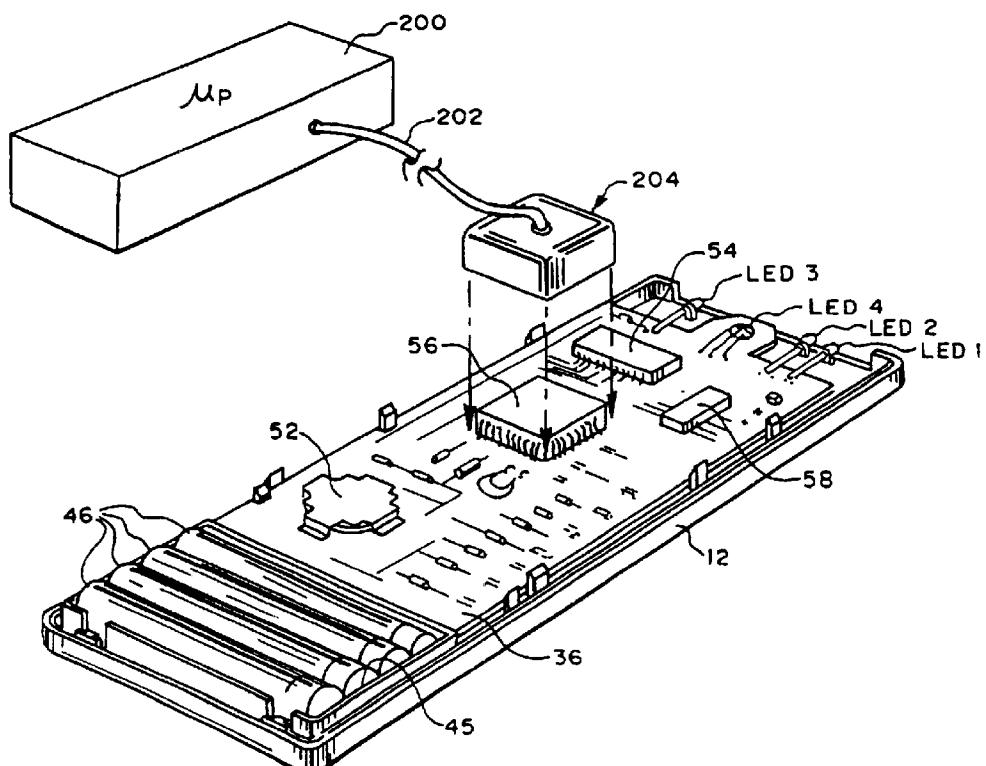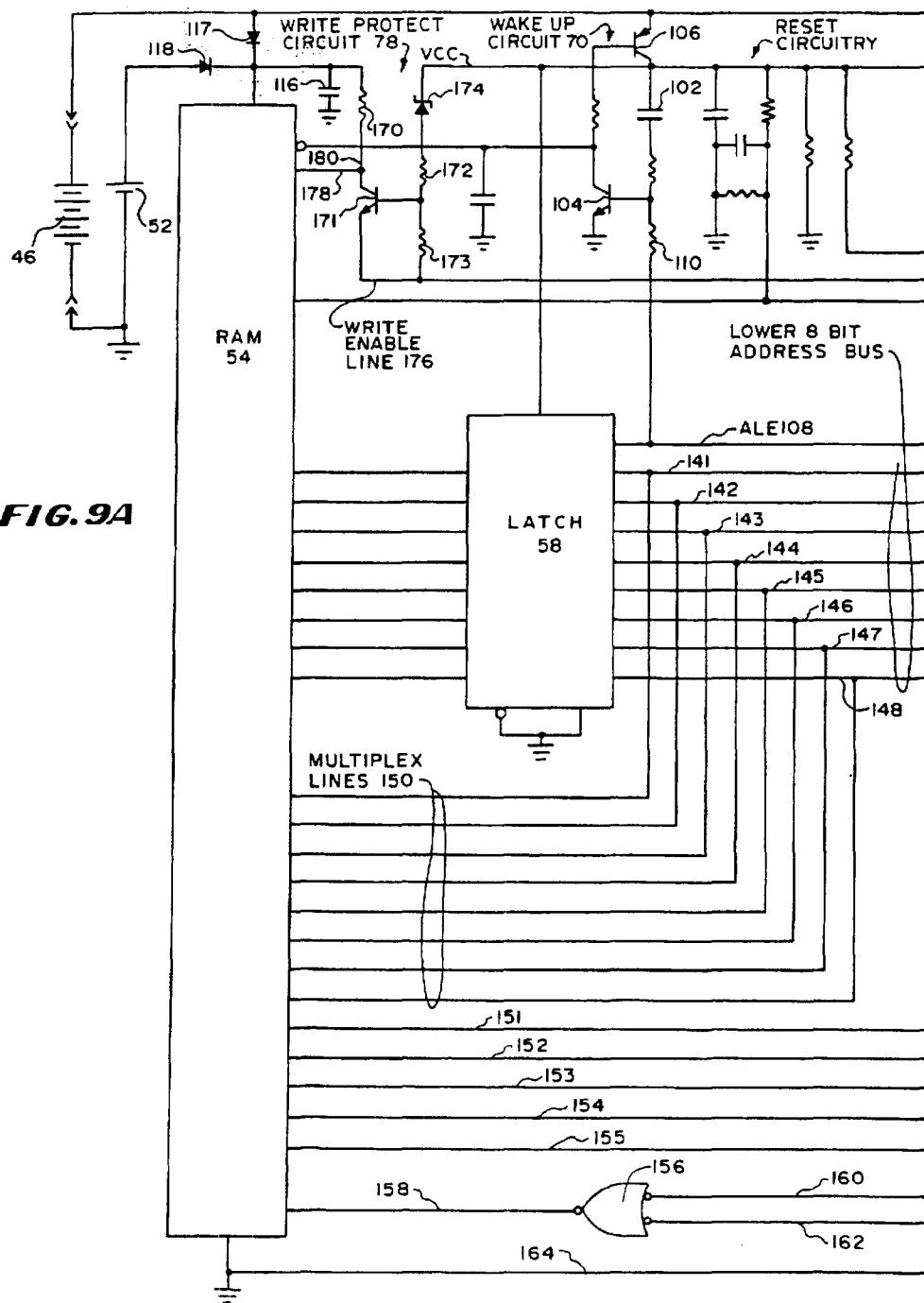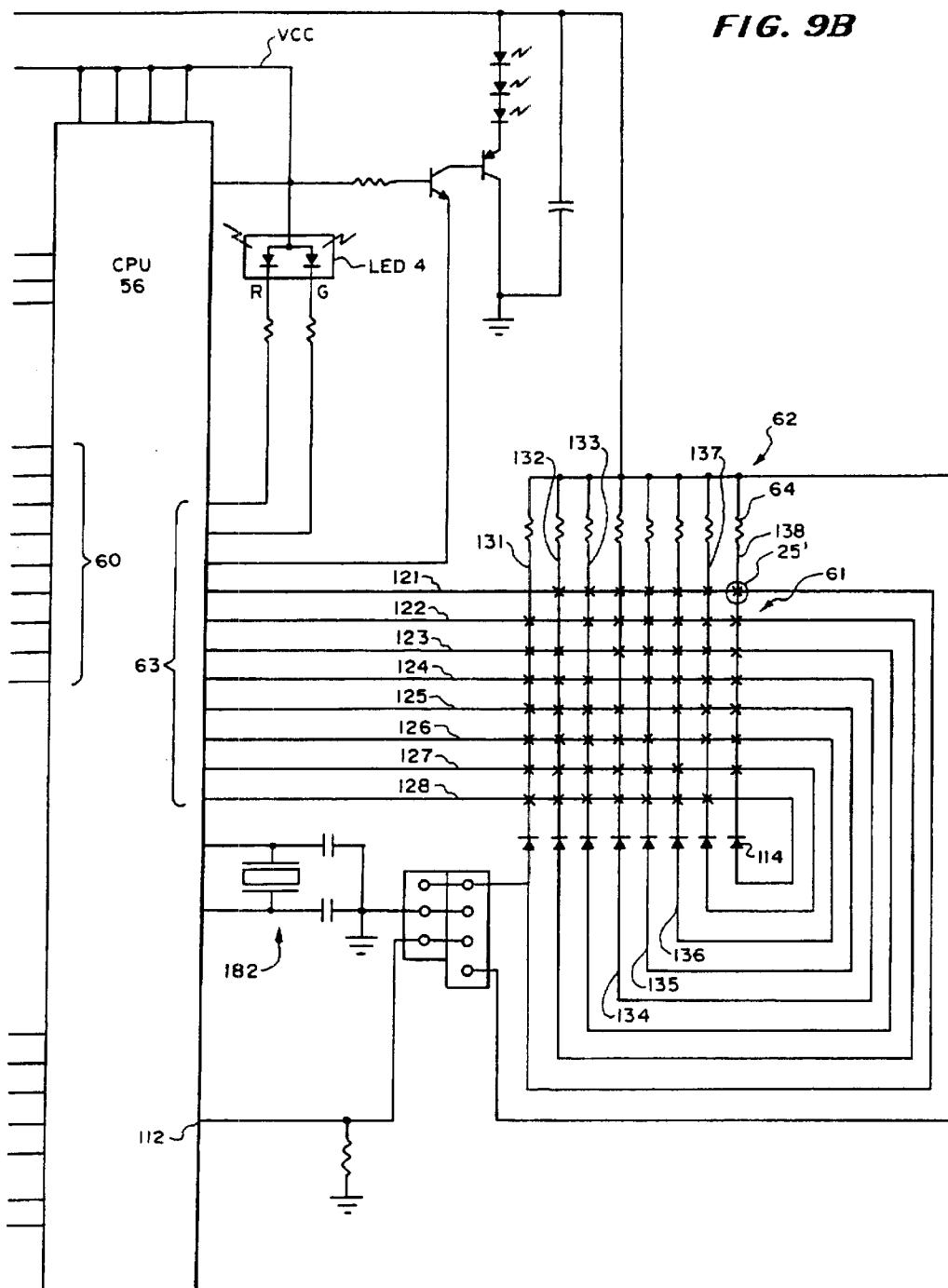
MODULATION SCHEMES
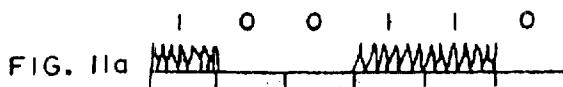
FIG. 11a   FIXED BIT TIME, FULL WIDTH BURST
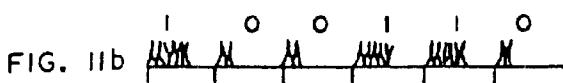
FIG. 11b   FIXED BIT TIME, BURST WIDTH MODULATED
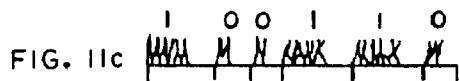
FIG. 11c   FIXED OFF TIME, BURST WIDTH MODULATED
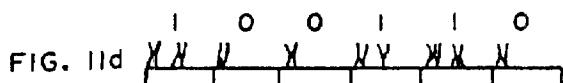
FIG. 11d   FIXED BIT TIME, SINGLE/DOUBLE BURST
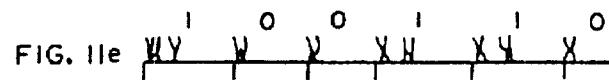
FIG. 11e   FIXED OFF TIME, SINGLE/DOUBLE BURST
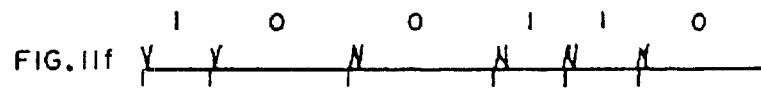
FIG. 11f   FIXED BURST TIME, OFF TIME MODULATED

FIG. 11g   RANDOM
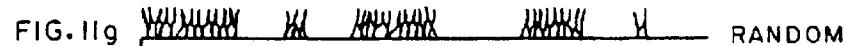
FIG. 11h   ONE FREQUENCY FOR EACH KEY
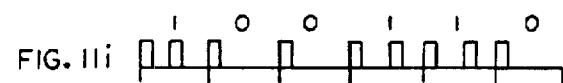
FIG. 11i   SINGLE/DOUBLE PULSE, FIXED BIT TIME

FIG. 12A
CAPTURING IR CODE

PASS 1

PRESS KEY ON TARGET REMOTE   STEP 1

TRANSFORM IR SIGNAL TO BIT STREAM   STEP 2

STORE BIT STREAM (OR RUN-LENGTH CODED BIT STREAM)   STEP 3

TRANSFORM STORED DATA TO LIST OF EXECUTABLE INSTRUCTIONS WHICH REPRODUCE BIT STREAM   STEP 4

TO PASS 2

FIG. 12B

eq.

BEGIN   IR ON   NOP   NOP   IR OFF   NOP   NOP   IR ON   NOP   NOP   IR OFF   NOP   BEGIN   JUMP TO BEGIN

FIG. 13A
CAPTURING IR CODE

PASS 2

| PRESS KEY ON TARGET REMOTE AGAIN | STEP 5 |

FIG. 13B

| FILTER OUT CARRIER FROM IR BIT STREAM | STEP 6 |

IR BIT STREAM

FILTERED BIT STREAM

| MEASURE ON TIMES AND OFF TIMES | STEP 7 |

ON TIME   OFF TIME

| STORE ON/OFF DATA | STEP 8 |

FIG. 13C

| ANALYZE DATA FOR REPETITION | STEP 9 |

FILTERED BIT STREAM

REPETITION (DISCARD)

| STORE REPETITION SCHEME | STEP 10 |

| STORE POINTER TO KEY | STEP 11 |

CODE CAPTURED

FIG. 14   GENERATING IR CODE
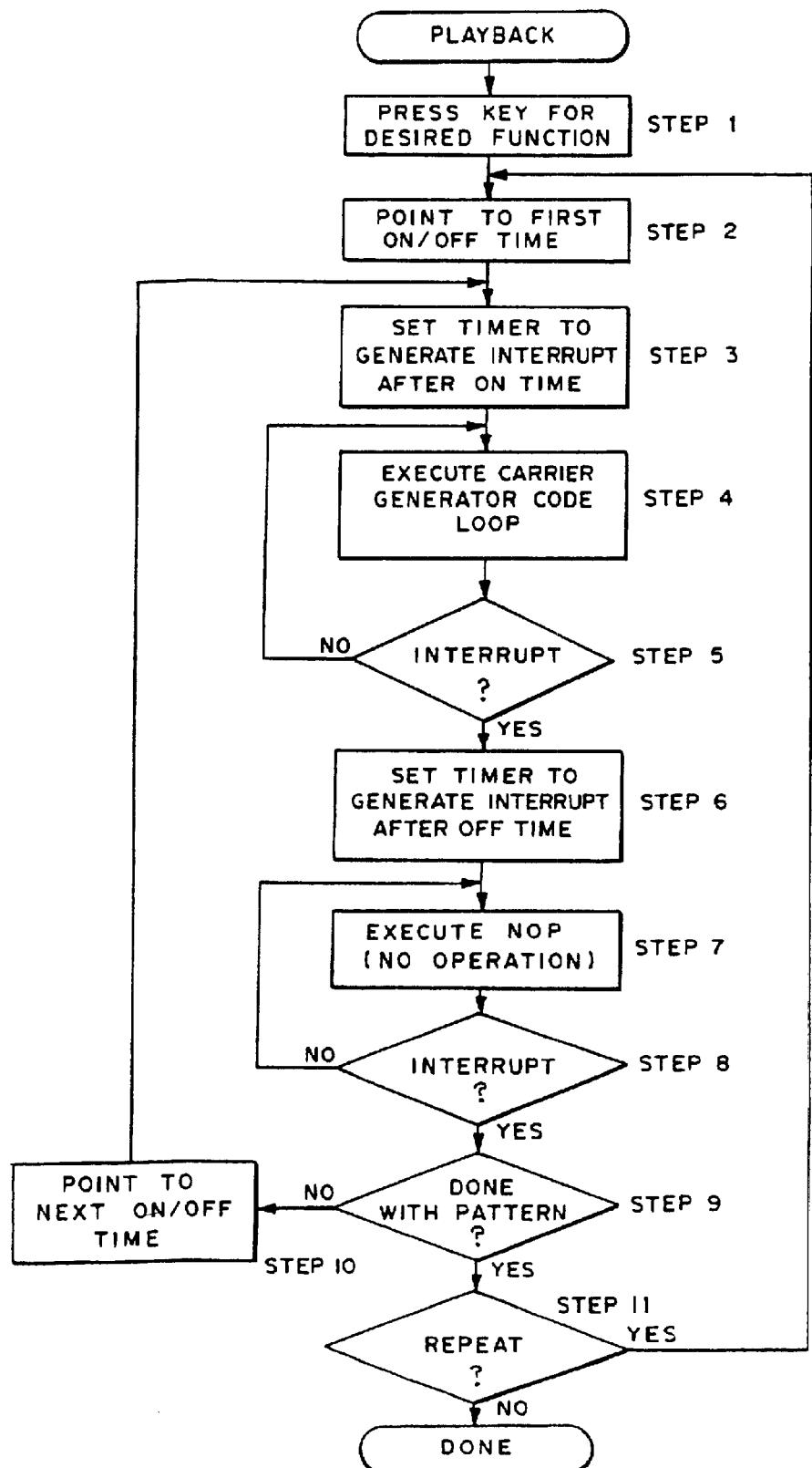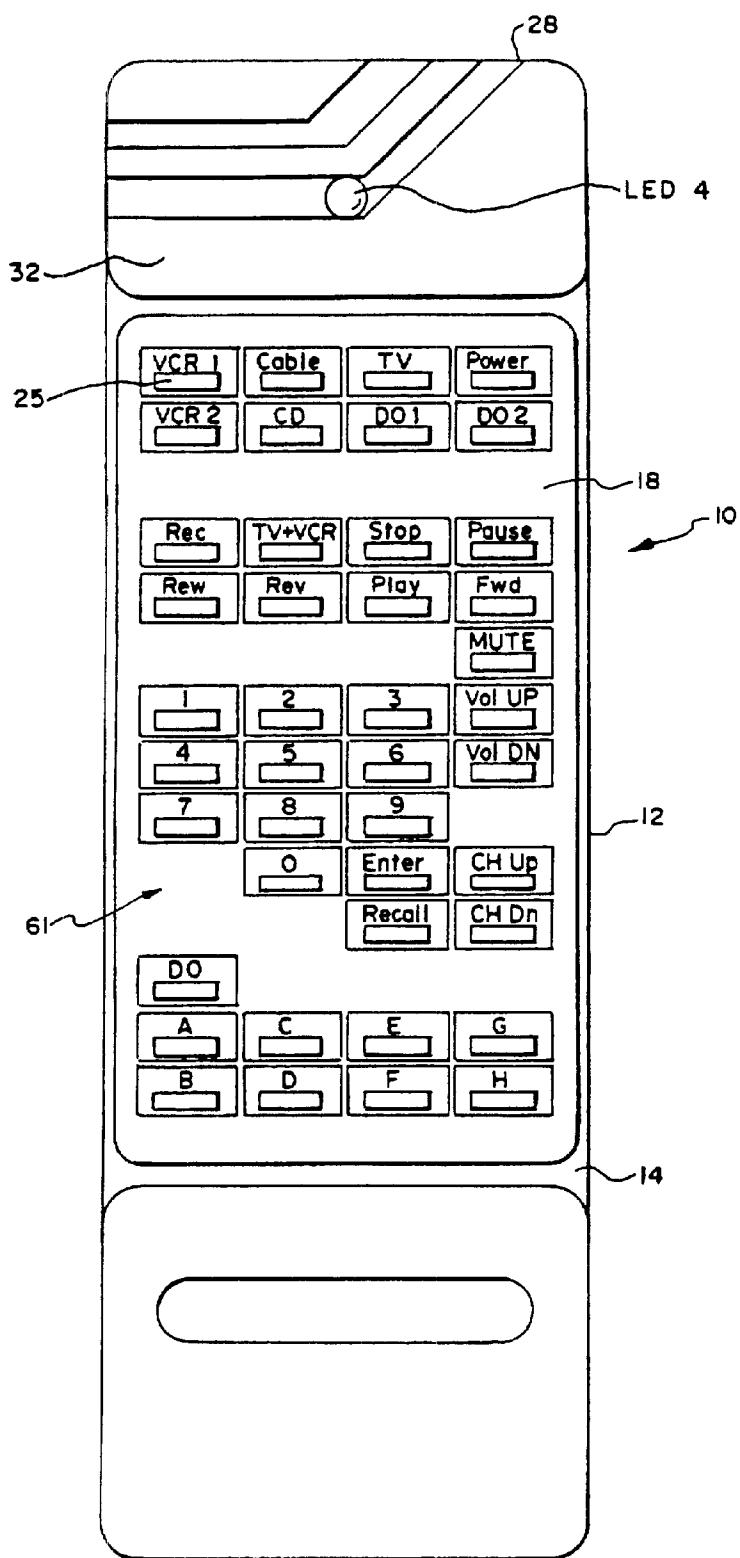
FIG. 15

FIG. 16

STEP AND SET METHOD
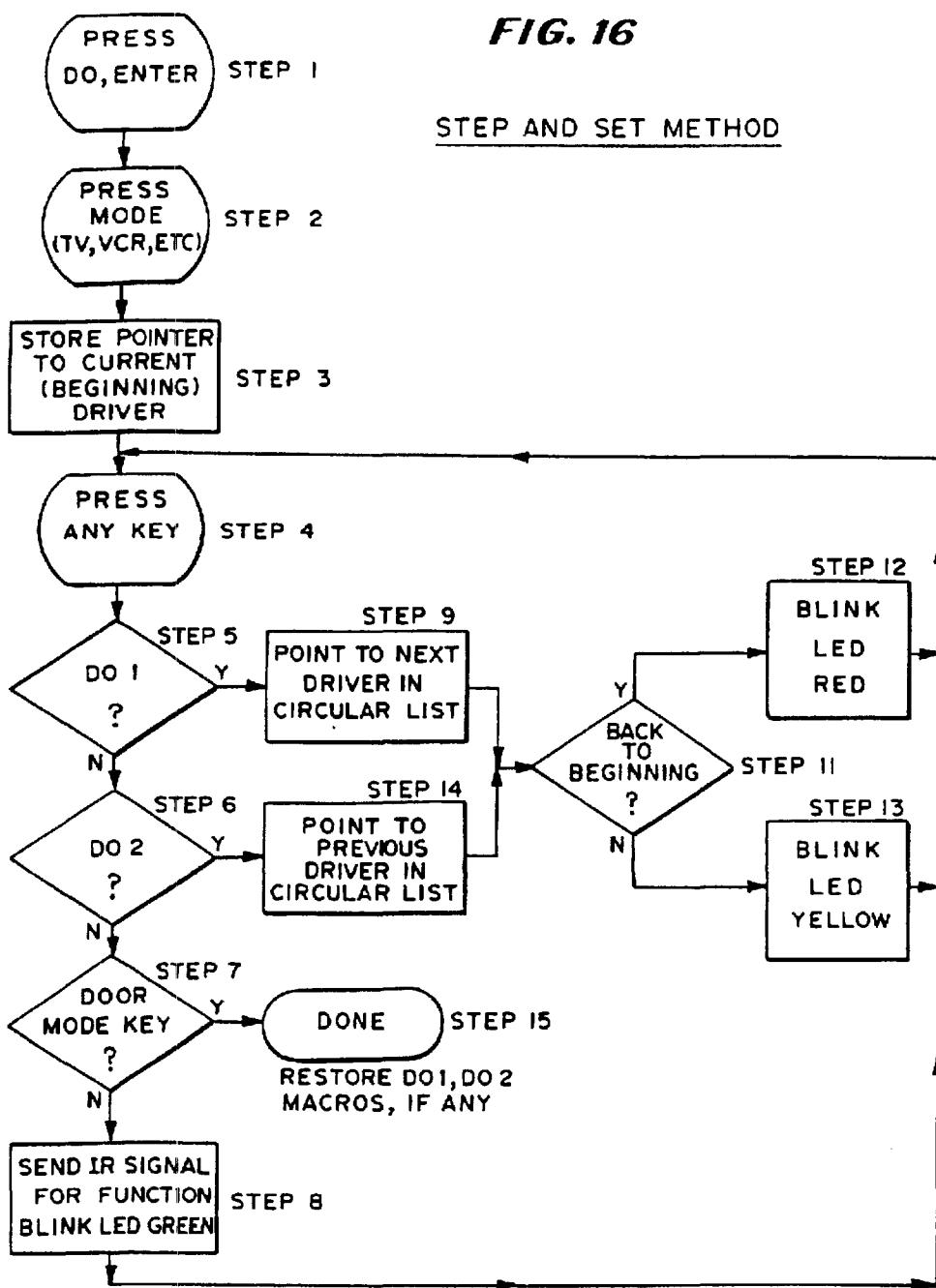
FIG. 17

DIRECT ENTRY—QUICK SET
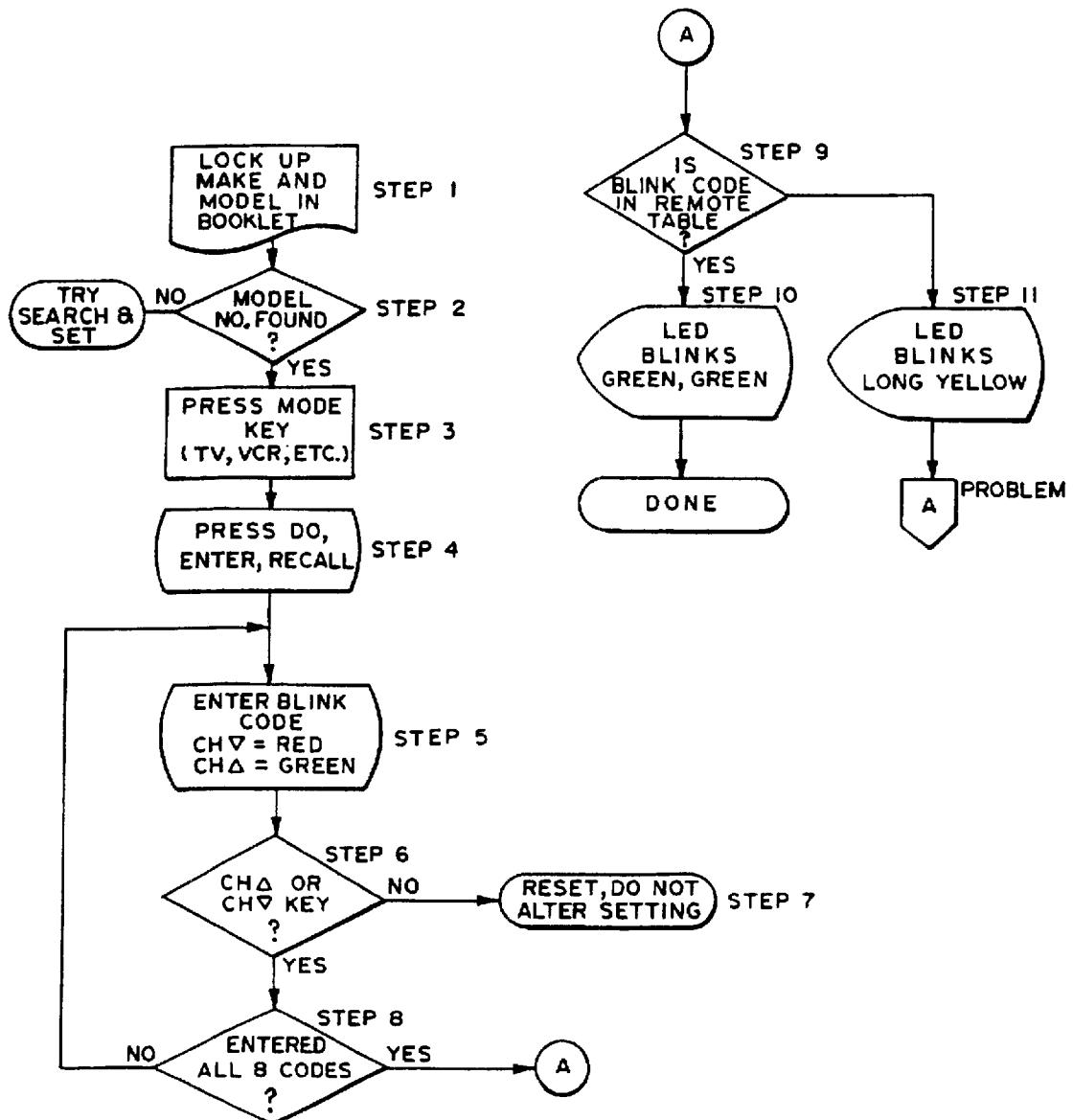
FIG. 18A

SETTING A "DO" COMMAND MACRO
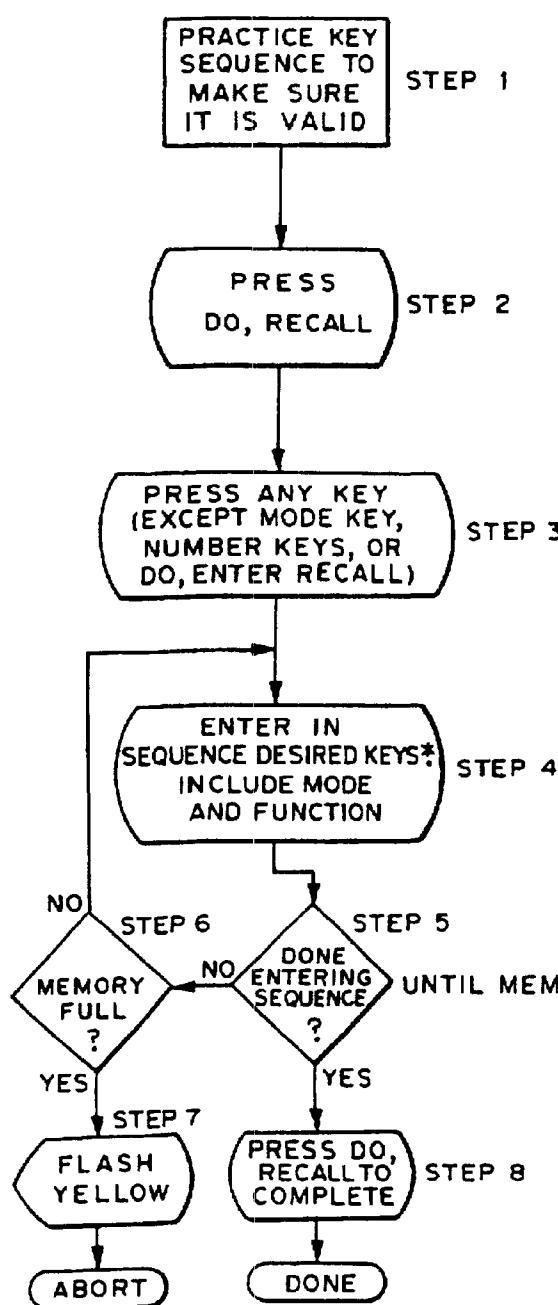
FIG. 18B

EXECUTING A MACRO "DO" COMMAND
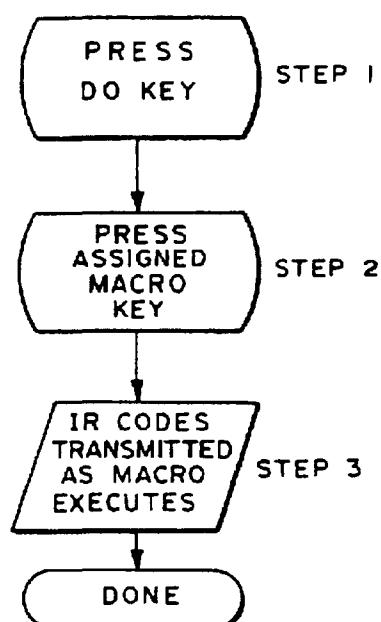
PRACTICE KEY SEQUENCE TO MAKE SURE IT IS VALID — STEP 1

PRESS DO, RECALL — STEP 2

PRESS ANY KEY (EXCEPT MODE KEY, NUMBER KEYS, OR DO, ENTER RECALL) — STEP 3

ENTER IN SEQUENCE DESIRED KEYS* INCLUDE MODE AND FUNCTION — STEP 4

STEP 6 — MEMORY FULL ? — NO / YES

STEP 5 — DONE ENTERING SEQUENCE ? — NO / YES — UNTIL MEMORY FULL

STEP 7 — FLASH YELLOW — ABORT

STEP 8 — PRESS DO, RECALL TO COMPLETE — DONE

PRESS DO KEY — STEP 1

PRESS ASSIGNED MACRO KEY — STEP 2

IR CODES TRANSMITTED AS MACRO EXECUTES — STEP 3

DONE

* eq. TV, POWER, VCR 1, POWER, PLAY, TV, 3, ENTER

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FIG. 19A

TO IDENTIFY WHAT DEVICE REMOTE IS SET FOR-BLINK CODE
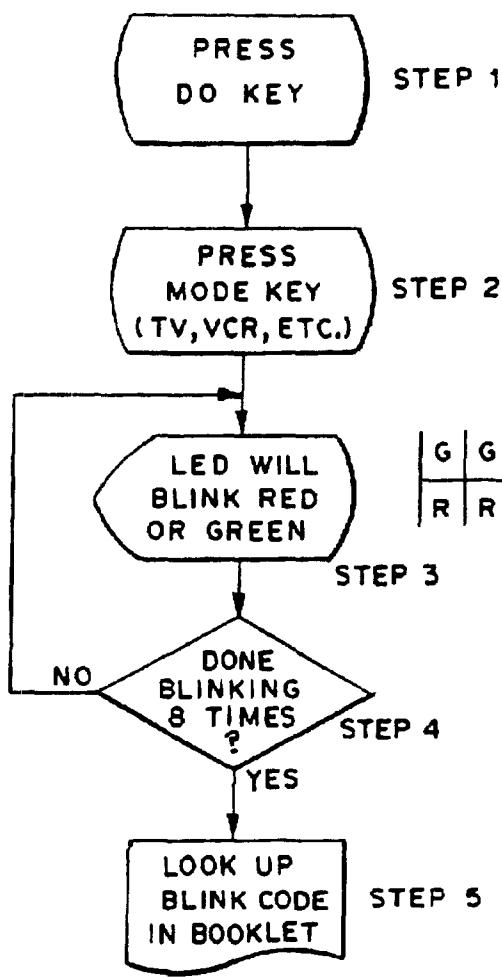
PRESS
DO KEY   STEP 1

PRESS
MODE KEY   STEP 2
(TV,VCR,ETC.)

FIG. 19B

LED WILL
BLINK RED
OR GREEN

G	G	G	G	G	G	G	G
R	R	R	R	R	R	R	R

STEP 3

DONE
BLINKING
NO   8 TIMES
?   STEP 4

YES

LOOK UP
BLINK CODE   STEP 5
IN BOOKLET

FIG. 20

FIG. 21

FIG. 22
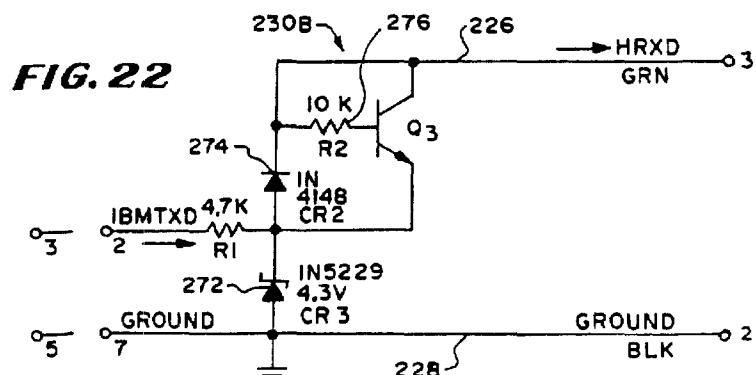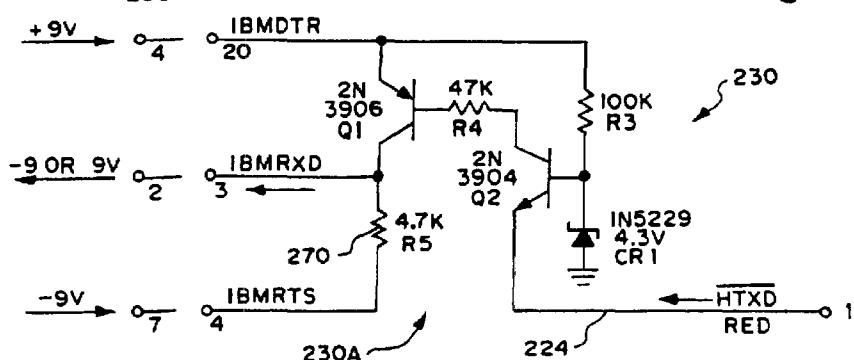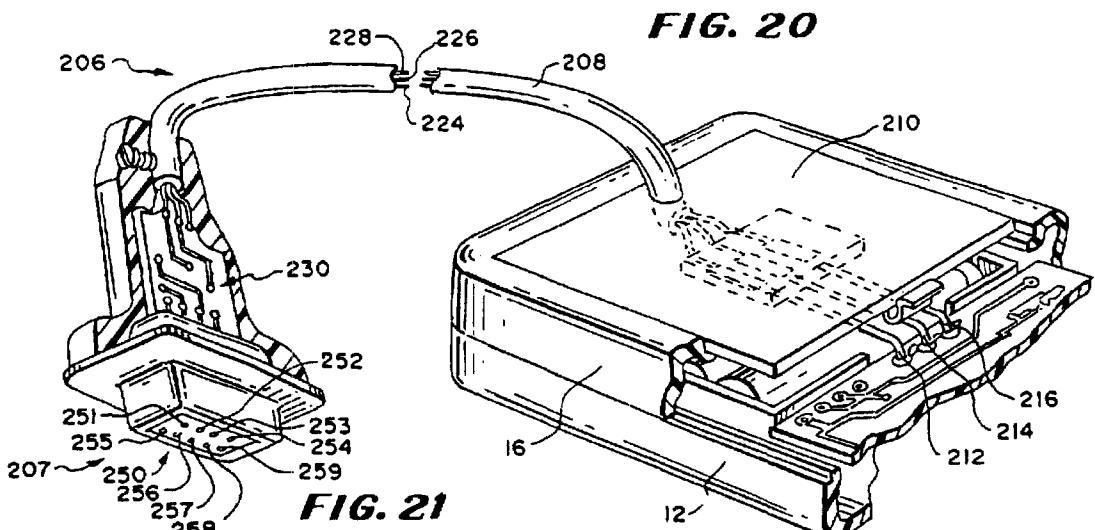
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UNIVERSAL REMOTE CONTROL WITH MACRO COMMAND CAPABILITIES

CROSS-REFERENCE TO RELATED APPLICATIONS

This patent application claims the priority date of U.S. application Ser. No. 109,336 filed on Oct. 14, 1987, now abandoned, as a continuation of U.S. application Ser. No. 09/408,729 filed on Sep. 29, 1999 now U.S. Pat. No. 6,195,033 which is a continuation-in-part of U.S. application Ser. No. 07/990,854 filed on Dec. 11, 1992, now U.S. Pat. No. 6,014,092, which is a continuation-in-part of U.S. application Ser. No. 07/913,523 filed on Jul. 14, 1992, now abandoned, which is a continuation-in-part of U.S. application Ser. No. 07/586,957 filed on Sep. 24, 1990, now abandoned, which is a continuation-in-part of U.S. application Ser. No. 07/127,999 filed on Dec. 2, 1987, now U.S. Pat. No. 4,959,810, which is a continuation-in-part of U.S. application Ser. No. 09/109,336 filed on Oct. 14, 1987, now abandoned.

This patent application contains the specification of U.S. application Ser. No. 127,999 filed on Dec. 2, 1987, now U.S. Pat. No. 4,959,810.

This patent application is also related to U.S. application Ser. No. 08/874,184 filed on Jun. 13, 1997, now U.S. Pat. No. 5,959,751, which is a continuation of U.S. application Ser. No. 08/706,794 filed on Sep. 3, 1996, now U.S. Pat. No. 5,689,353, which is a continuation of U.S. application Ser. No. 08/314,970 filed Sep. 29, 1994, now U.S. Pat. No. 5,552,917, which is a divisional of U.S. application Ser. No. 08/093,512 filed on Jul. 16, 1993, now abandoned, which is a continuation of U.S. application Ser. No. 07/586,957 filed on Sep. 24, 1990, now abandoned, which is a divisional of U.S. application Ser. No. 07/127,999 filed on Dec. 2, 1987, now U.S. Pat. No. 4,959,810, which is a continuation-in-part of U.S. application Ser. No. 07/109,336 filed Oct. 14, 1987, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a universal remote control device of the type which is hand held and which can be coupled via coded infrared signals with a remote control receiver built into a television or other remotely controlled electrical apparatus to turn on the apparatus, such as the television, at a distance, to adjust the volume, tone and brightness, to change channels, and to turn the television off.

Additionally, the present invention relates to a method for acquiring the infrared codes for a controlled apparatus, such as a television, generating code data related to these infrared codes for storage in a remote control device and methods for using the remote control device for finding, in a library or table of code data for generating infarared codes for operating different electrical apparatus manufactured by different manufacturers stored in a RAM of the remote control device, the code data for generating infrared coded signals for operating a particular apparatus, such as a television, and then for using the stored code data for generating the coded infrared signals for operating the controlled apparatus.

2. Description of the Prior Art

Heretofore it has been proposed to provide a reconfigurable remote control device and programmable functions for such a remote control device which will enable one to learn, store and retransmit infrared codes that are emitted from the controller for a remotely controlled apparatus, such as a television.

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For example, in the Welles II U.S. Pat. No. 4,623,887 and the Ehlers U.S. Pat. No. 4,626,848, there is disclosed a reconfigurable remote control device which has the ability to learn, store and repeat remote control codes from any other infrared transmitter. Such a reconfigurable remote control transmitter device includes an infrared receiver, a microprocessor, a non-volatile random access memory, a scratch pad random access memory, and an infrared transmitter.

According to the teachings of the Ehlers patent, the infrared signals received by the remote control device are in bursts of pulses and the device counts the number of pulses in each burst as well as the time duration of each pause in a transmission between bursts.

As will be described in greater detail hereinafter, the universal remote control device of the present invention utilizes a single non-volatile RAM does not provide a separate scratch pad RAM or, more importantly, a ROM.

In learning the infrared code and transforming same to code data which is then stored in a RAM of the control device and later used to generate infrared codes, a novel method is utilized wherein no counting of pulses takes place, and only the time duration of the pulses in a burst of pulses from the leading edge of the first pulse in a burst of pulses to the trailing edge of the last pulse in the burst as well as the time duration of the pause between bursts are sensed and used to learn and later to generate the infrared codes.

Additionally, unique methods for use of the remote control device are provided so that a number of infrared operation code sequences can be generated by the remote control device for operating various types of electronic apparatus.

SUMMARY OF THE INVENTION

According to the invention there is provided a universal remote control system having input means for inputting commands, signal output means for supplying infrared signals to a controlled device, a central processing unit (CPU) coupled to the input means and to the signal output means, a single non-volatile, read-write RAM (such as a battery-backed RAM) coupled to the central processing unit and data coupling means including terminal means coupled to the CPU for enabling new code data to be supplied from outside the system to, or retrieved from the RAM through the terminal means and the CPU.

Further according to the invention, there is provided a method of loading a RAM in a ROM-less microprocessor system comprising a central processing unit, a single non-volatile, read-write RAM, input means, output means, and means for coupling said central processing unit, said RAM, said input means, and said output means together, said method including the steps of:

(a) disabling the central processing unit;

(b) connecting a separate microprocessor system to said RAM;

(c) transferring instructions and/or data to said RAM;

(d) re-enabling the central processing unit to enable the central processing unit to execute the instructions so transferred.

Still further according to the present invention, there is provided a process of learning, storing and reproducing the remote control codes of any of a diverse plurality of remote control transmitters, comprising the steps of:

(a) receiving a transmission of a train of pulses from a remote control transmitter;

(b) recording the point-in-time of an edge of each pulse in a train of said pulses;

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<table>
<tr><td>3</td><td>4</td></tr>
</table>

(c) transforming the recorded point-in-time data into a list of instructions for generating a replica of said train of pulses;

(d) timing the duration of a train of said pulses;

(e) timing the period between trains of pulses;

(f) associating a function key of a universal remote control device with said time duration of said train of pulses and said list of instructions for generating a replica of said train of pulses;

(g) determining whether or not repetitions of the transmission of train of pulses is present;

(h) ignoring repetitions of the train of pulses;

(i) noting that repetitions are present; and

(j) storing for use in a universal remote control device, the information acquired in steps (c), (d), (e), (f) and (i).

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of the universal remote control device constructed according to the teachings of the present invention.

FIG. 2 is an exploded perspective view of the control device shown in FIG. 1.

FIG. 3 is an enlarged fragmentary sectional view through two of the push buttons of the control device shown in FIGS. 1 and 2.

FIG. 4 is a fragmentary corner view of a push button containing panel and a base panel.

FIG. 5 is a fragmentary corner view similar to FIG. 4 as the panels are brought together and shows one of the push buttons cut away from the push button containing panel.

FIG. 6 is a fragmentary sectional view of the assembly 15 formed by bringing the push button containing panel into engagement with the base panel.

FIG. 7 is a plan view of the circuit board assembly mounted inside the control device viewing the control device from the back side thereof with a back cover panel removed.

FIG. 8 is a block diagram of the operating circuitry in the control device.

FIGS. 9A & 9B are a detailed schematic circuit diagram of the operating circuitry shown in FIG. 8.

FIG. 10 is a perspective view showing the connection of a programming connector over the central processing unit of the operating circuitry in the control device, the programming connector being connected to a microprocessor, being operable to disable the central processing unit, and being used to program the random access memory (RAM) of the operating circuitry.

FIGS. 11a to 11i are graphical representations of several modulation schemes which are used in infrared remote control transmitters.

FIG. 12A is a flow chart of a first part of a method for capturing an IR code and FIG. 12B is a graph of the envelope of the code.

FIG. 13A is a flow chart of a second part of a method for 5 capturing an IR code; FIG. 13B is a waveform of the IR bit stream and filtered bit stream; and FIG. 13C is a graph of the waveform of a filtered repetition of a filtered bit stream.

FIG. 14 is a flow chart of the method used for generating an infrared code.

FIG. 15 is a front plan view of the control device shown in FIG. 1 and shows the various pushbuttons of the device.

FIG. 16 is a flow chart of the search and set procedure followed in using the control device of the present invention.

FIG. 17 is a flow chart of a direct-entry/quick-set procedure followed in using the remote control device.

FIG. 18A is a flow chart of the procedure followed in setting a "DO" command and FIG. 18B is a flow chart of the method for executing a "DO" command.

FIG. 19A is a flow chart of the method used to identify what type of unit the remote control device is set for and FIG. 19B is a table of the identifying blink code.

FIG. 20 is a fragmentary perspective view with portions broken away of a connector with conversion circuitry therein and a special battery case cover for the control device by which new data can be inputed into the RAM of the operating circuitry of the control device.

FIG. 21 is a schematic circuit diagram of part of the conversion circuitry in the connector shown in FIG. 20.

FIG. 22 is a schematic circuit diagram of another part of the conversion circuitry in the connector shown in FIG. 20.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 in greater detail, there is illustrated therein a universal remote control device 10 constructed according to the teachings of the present invention.

As shown, the device 10 includes a housing 11 including an upper housing member 12 having a base panel 14, and a lower housing member 16. An overlay face panel 18 is positioned over the base panel 14.

The two panels 14 and 18 have openings 22 and 24 (FIG. 2) therethrough for receiving elastomeric pushbuttons 25, all of which extend from and are fixed to or integral with an elastomeric body panel 26 as shown in FIG. 2.

The pushbuttons 25 are arranged in rows and columns and are identified as follows on the overlay face panel 18:

VCR 1	Cable	TV	Power
VCR 2	CD	DO 1	DO 2
Rec	TV.VCR	Stop	Pause
Rew	Reverse	Play	Fast Fwd
			Mute
1	2	3	Vol Up
4	5	6	Vol Dn
7	8	9	
		0	Enter	CH Up
		Recall	CH Dn
DO			
A	C	E	G
B	D	F	H

This arrangement is shown in FIG. 15 and the manner in which these pushbuttons 25 are utilized in operating the control device 10 will be described in greater detail in connection with the description of FIGS. 15–19B.

At a top or forward end 28 of the device 10, there is provided an opening 30 for three light emitting diodes, LED 1, LED 2 and LED 3. The opening 30 is covered by an infrared-transport lens 31. Also, provided on a top surface 32 of the upper housing member 12 of the control device 10 is a light emitting diode, LED 4, by which information, in the form of red and green blink codes, is communicated to the user of the device 10.

FIG. 2 is an exploded view of the components of the device 10. As shown, the device 10 includes the overlay face panel 18 with pushbutton-receiving, generally rectangular openings 22, the upper housing member 12 with base panel 14 having a plurality of generally rectangular, pushbutton receiving openings 24, the elastomeric body panel 26 having

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pushbuttons **25** extending from an upper surface **34** thereof, a printed circuit board **36** having conductive switches **38** on an upper surface **40** thereof and operating circuitry **42** (FIG. **7**) mounted on the underside **43** thereof, the lower housing member **16**, a cover **44** for a battery compartment **45** (FIG. **7**) for receiving batteries **46** (FIG. **10**) for the circuitry **42** of the control device **10**, and the infrared-transport lens **31**.

It will be noted that the base panel **14** of the upper housing member **12** has pushbutton openings **24** completely across each one of fourteen (14) rows across and four (4) columns down. However, not all of these openings or holes **24** have pushbuttons **25** extending therethrough, as noted by the lesser number of pushbutton-receiving openings **22**, in the overlay face panel **18**. Likewise, the body panel **26** initially has pushbuttons **25** arranged completely across the upper surface **34** thereof in fourteen (14) rows across and fourteen (14) columns down.

The printed circuit board **36** has conductive switches **38** aligned with each one of the pushbuttons **25** so that more switches **38** are provided than may be necessary for this particular control device **10**.

The availability of additional pushbutton openings **24** in the base panel **14** will enable the control device **10** to be modified as necessary by the addition of further pushbuttons **25** to perform numerous other functions as called for.

This mechanical construction of the upper and lower housing members **12** and **16** and the panels **14** and **18** and circuit board **36** enable the control device **10** to be modified to include additional circuits in the operating circuitry **42** and pushbutton switches **25** for performing additional functions, if desired. In this respect, overlay face panel **18** is easily replaceable to modify the device **10** to include more or less pushbuttons **25** and associated switches **38**.

The simplicity of the construction of the pushbuttons **25**, the base panel **14** and the overlay panel **18** is shown in FIGS. **3–6**. As shown in FIG. **3**, the body panel **26** has a plurality of raised pushbuttons **25** formed thereon. Each raised rectangular button **25** has a recessed area or hollow **48** on the underside **49** of each button **25** in which is mounted a conductive plunger or puck **50** adapted to engage one of the conductive switches **38** on the circuit board **36**. With the pushbuttons **25** and the panel **26** being formed from a sheet of elastomeric material it is an easy matter to remove the buttons **25** that are not necessary with a scissors or other cutting element, as shown in FIG. **4**.

Then, the pushbutton body panel **26** is moved into engagement with the base panel **14**, as shown in FIG. **5**, to form the assembly shown in FIG. **6**.

After the pushbutton body panel **26** and the base panel portion **14** have been assembled as shown in FIG. **6**, the overlay face panel **18** is mounted on top of the base panel **14** and the circuit board **36** is mounted within the housing member **12**.

Referring now to FIG. **7**, there is illustrated therein the operating circuitry **42** of the control device **10** which includes batteries **46** (FIG. **10**) mounted in the compartment **45** for providing power for the circuitry **42** and a lithium battery **52**, which backs up a statuc RAM **54**. A central processing unit (CPU) **56**, is coupled through a latch **58** to the RAM **54**. Three LEDs, LED **1**, LED **2**, and LED **3** are coupled to the circuitry **42** for communication with the apparatus to be controlled. All elements of the circuitry **42** are mounted on the circuit board **36** mounted in the upper housing member **12**. A further LED, LED **4** is coupled to CPU **56** for communication with the user of the device **10** as will be described in greater detail below.

A block schematic circuit diagram of the operating circuitry **42** is shown in FIG. **8** and includes CPU **56**, the

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infrared light emitting diodes, LED **1**, LED **2**, and LED **3** coupled to the CPU **56**, serial input/output ports **60** of CPU **56**, the RAM **54** coupled to CPU **56** and backed up by lithium battery **52** and a 4×14 keyboard **61** coupled to CPU **56**. The four AAA batteries **46** are also shown.

FIGS. **9A** and **9B** are a detailed schematic circuit diagram of the operating circuitry **42**. The operating circuit **42** includes the central processing unit **56**, the latch **58**, the random access memory **54** and LED **1**, LED **2**, LED **3** and LED **4**.

The operating circuitry also includes several subcircuits. One of those subcircuits **62** (FIG. **9B**) includes the keyboard **61** having pushbuttons **25**, each of which is connected to a port **63** of the CPU **56** shown in FIG. **9B** and can be referred to as the keyboard circuit **62**. The X's in FIG. **9B** indicate the pushbuttons **25** and when one of those pushbuttons X is pressed, current flows through a resistor in a column line, e.g., when button **25'** is pressed current flows through resistor **64** in column line **138** going to the button or key **25'**. That raises the voltage on a supply line VCC to the CPU **56** of the microprocessor.

Accordingly, whenever a button **25** is pressed, it will increase the voltage on line VCC which initiates a switching process in a wake up circuit **70** for "waking up" or energizing the CPU **56** in the manner described below.

In addition to the keyboard circuit **62** and the wakeup circuit **70**, the subcircuits include a reset circuit **74**, and a write protect circuit **78**.

When the voltage on line VCC goes up, a signal is passed through capacitor **102**, to the base of a transistor **104** in the wake up circuit **70**. This turns on the transistor **104** which in turn turns on transistor **106** This turning on of the transistors **104** and **106** will bring voltage on line VCC to the full DC voltage of about 5½ volts. When the voltage on line VCC reaches 5½ volts, the CPU **56** begins to operate.

When operating, the CPU **56** establishes a signal on line ALE **108** which is passed through a resistor **110** and filtered by capacitor **102**. Once the ALE signal is established, it causes a voltage to be generated at the base of transistor **104**, maintaining transistor **104** turned on, which in turn maintains transistor **106** turned on, thus enabling the CPU **56** to continue to run. The CPU **56** can turn itself off by executing a HALT instruction which causes the ALE signal to cease, thus turning off transistors **104** and **106** and removing power via line VCC to the CPU **56**.

It is to be noted that the wake up circuit **70** can be activated by depression of a key or button **25** or by an input signal at serial port 3 coupled to an input port **112** of the CPU **56**.

The circuit elements described above form the wakeup circuit **70** for activating the operating circuitry **42** of the device **10**. This circuit uses substrate static-protection diodes **114** in a CMOS chip coupled to the keyboard **61**. With this arrangement, source current is supplied to transmitter **104** via line VCC when a key or pushbutton **25** is depressed.

The RAM **54** is connected to the lithium battery **52** and, when the device **10** is not being used, draws about 20 nanoamps from the battery **52**, which gives the device **10** a shelf life between 5 and 10 years. A backup capacitor **116** is coupled to the RAM **54** and has (at 20 nanoamps) a discharge time of about 10 minutes, providing ample time to change (if necessary) the battery **52** without losing the instructions and data stored in the RAM **54**. Capacitor **116** is kept charged by battery **46** through diode **117** when the device **10** is operating and, at other times, by battery **52** through diode **118**.

After the CPU **56** has been powered up, or awakened, the CPU **56** makes a scan of row lines **121–128** to the keyboard

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61 by sequentially forcing each line 121–128 low and then polling the other lines to find out which button 25, such as button 25', has been pressed. As a result of pushbutton 25' being pressed, a low impressed upon row line 121 will cause a low on column line 128 and that will result in the row line 128 being low.

The CPU 56 first sets row line 121 low and then begins scanning, starting with the row line 122, for another row line having a low voltage thereon and by finding the row line with the low voltage, in the above example, row line 128, the CPU 56 knows that button 25' at the intersection of row line 128 and column line 138 has been depressed.

If the CPU 56 had not found a low on another row line, such as row line 128, after having set line row 121 low, line 121 is returned to its previous value and row line 122 is then set low, and the scan continued until a low row line is found to identify which button 25 has been depressed.

When the CPU 56 determines which pushbutton 25 has been depressed the CPU 56 will then know what function is to be carried out.

It is to be noted that the keyboard circuit 62 is uniquely designed to include only eight (8) row lines 121–128 and eight (8) column lines 131–138 each having a resistor 64 and a current directing diode 114 therein and each being arranged across the row lines 131–138 so that 56 switch positions are provided with only eight (8) lines.

All memory cycles exercised must involve the latch 58 because the CPU 56 has its data bus multiplexed with the lower 8 bits of the address bus on lines 141–148.

Coming out of the CPU 56 to the latch 52, is a group of nine (9) lines 108 and 141–148. One of the lines, line 108, carries the ALE signal. The eight (8) lines 141–148 between the latch 58 and the CPU 56 are the multiplexed data and address bus lines. These lines comprise the lower 8 bits of the address bus. A group of multiplex lines are identified with reference numeral 150. Five more lines 151–155 comprise the upper five bits of the address bus, making a total of 13 bits of address.

An inverting OR gate 156 having an output line 158 and two input lines 160 and 162 together with ground line 164 are coupled between the CPU 56 and the RAM 54. The line 158 defines an output enable for the RAM 54.

Accordingly, when the CPU 56 wants to do a read, it actuates either of the two input lines 160 or 162 going into the OR gate 156. Line 160 is a PSEN line for telling the RAM 54 that it is to be enabled to receive data and line 162 in a Read Output line to tell the RAM 54 that the CPU is going to read the information stored in the RAM 54. With OR gate 156 the two lines and functions are combined on one line 158. In other words, the CPU 56 tells the RAM 54, through the OR gate 156, that it wants to read information stored in the RAM 54.

The circuitry 42 also includes the write protect circuit 78 which has the double duty of being a low battery indicating circuit. The circuit 78 includes a resistor 170, a transistor 171, two resistors 172, 173 and a Zener diode 174 connected as shown.

A write enable line 176 is connected between the transistor 171 and the CPU 56.

When the CPU 56 desires to write information into the RAM 54, it places the address on the address bus lines 141–148 and 151–155, strokes the lower 8 bits of the address bus on lines 141–148 into the latch 58 using ALE line 108, places the information on the data bus lines 141–148, and then brings the write enable line 176 low.

When the write enable line 176 goes low, unless the transistor 171 is turned on by virtue of the battery voltage

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being more than 4.3 volts, a line 178 going into the RAM 54 at the collector 180 of the transistor 171 (which is the "write enable" for the RAM 54), is prevented from going low, maintaining the RAM "Write Protected". This condition also is created when the battery 48 is low. The "write enable" line 176 also functions as a low battery detector because, during execution of the program, a check is made to see whether writing to the RAM 54 is enabled. If it is not, this shows that the batteries are weak and a signal is sent to the user by flashing the red LED, of LED 4, 5 times.

Note that LED 4 includes a red LED and a green LED incorporated into one package so that when both LEDs are turned on, a yellow light is emitted, making LED 4 a tricolor LED. Such tricolor LED 4 enables the device 10 easily to communicate to the user by way of the color, number and sequence of light blinks.

A clock circuit 182 including a crystal resonator is coupled to the CPU 56.

Three serial ports 1–3 are coupled to the CPU 56 and include port 1 which is a transmitting port, port 2 which is ground and port 3 which is a receiving port. Serial port 1 is connected to row line 121 so that data can be serially transmitted in the form of highs and lows by CPU 56 from the RAM 54 over row line 121 to serial port 1. Incoming data is received serially at serial port 3 and conveyed to input port 112, when it is desired to update the code data and/or instructions in the RAM 54.

The three infrared-emitting LEDs, LED 1, LED 2, and LED 3 are connected in the circuitry 42 as shown.

The reset circuit 74 includes two resistors and a capacitor connected as shown and coupled between line VCC and a reset line 184.

As will be described in greater detail in connection with the description of FIGS. 11–14, the manufacturer of the device 10, using known methods or the method described herein with reference to FIGS. 12A–13C, will decipher the infrared codes for operating various pieces of equipment, such as a TV, a VCR, a CD, a Cable Converter or other equipment which is controlled by a remote infrared transmitting device.

After the infrared code is deciphered, the code data theefor and instructions for generating such code (see the flow chart in FIG. 14) are stored in a programming computer 200 (FIG. 10) and the device 10 is programmed as explained below.

It is to be noted that the circuitry 42 has no ROM and all instruction codes and code data are loaded directly into the RAM 54. This allows for infinite upgradability in the field via the serial ports 1, 2, 3.

FIG. 10 is a perspective view of a programming computer 200 coupled by a cable 202 to a special connector 204 which is adapted to be received over the CPU 56 in the operating circuitry 42 for disabling the CPU 56 and for enabling the RAM 54 to be programmed by the programming computer 200. Essentially this is done by tri-stating the CPU 56 and placing the RAM 54 into the address space of the computer 200 which writes initial instruction code including code for the serial port driver, and subsequently serially, other instruction code and code data into the RAM 54. For this purpose the programming computer 200 has instruction codes such as serial port driver instructions and data relative to the infrared codes for operating a multiple number of electronic apparatus, such as televisions, VCR's, etc stored therein. Signals from the programming computer 200, via the connector 204 causes the inputs and outputs 60 of the CPU to be disabled so that instruction codes and data can be input into the RAM 54 quickly and efficiently from the

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programming computer after the operating circuitry **42** is mounted in the control device **10**.

Later, after the device **10** has been in use for some time and the RAM **54** needs to be updated with instruction codes and data relative to new equipment on the market, the control device **10** can be simply and easily updated at a service outlet having an ordinary personal computer with a serial port using a novel nine pin to three pin, 9 volt to 5 volt, signal coupling and converting assembly **206** (FIG. **20**). The updating can be done by adding to the data in RAM **54** or by rewriting (writing over) the data in RAM **54**. The assembly **206** is described in greater detail hereinafter in connection with the description of FIGS. **20–22**.

The infrared codes to be learned include a wide range of different codes for operating different electrical apparatus manufactured by the same or different manufacturers. In FIG. **11**, which is identical to FIG. **1** in U.S. Pat. No. 4,623,887, there are illustrated several modulation schemes for infrared codes. FIGS. **11**a–**11**g illustrate different types of gated carrier frequencies. Typical carrier frequencies for infrared remote transmitters are 20 Khz to 45 Khz, with the majority being at 38 Khz and 40 Khz. The gating schemes illustrated include both fixed and variable bit periods, non-return to zero (NRZ), variable burst widths, single/double burst modulation schemes, and a final catch-all category called random because there is no readily distinguishable pattern of ones and zeros.

In addition to these schemes, there is also a transmitter which puts out a different continuous frequency (CW) for each key as represented in FIG. **11**h.

Finally, several new types of transmitters do not use a carrier frequency at all but instead send a stream of pulses where the dat is encoded in the spaces between the infrared pulses as shown in FIG. **11**i.

Data modulation schemes for most transmitters have a higher level of data organization which may be called a keyboard encoding scheme which causes different data to be sent depending upon the transmitter and the key pressed. This will be described in greater detail hereinafter in connection with FIGS. **15–19**.

The code data for the infrared codes may be obtained from vendor information sheets and specifications, can be determined using the methods disclosed in U.S. Pat. Nos. 4,623, 887 and 4,626,848, or by the method disclosed herein.

In the method for learning or acquiring code data for infrared codes disclosed herein, no counting of pulses is carried out. Instead the method involves the following steps:

(a) receiving a transmission of a train of pulses from a remote control transmitter;

(b) recording the point-in-time of an edge of each pulse in a train of the pulses;

(c) transforming the recorded point-in-time data into a list of instructions for generating a replica of the train of pulses;

(d) timing the duration of a train of the pulses;

(e) timing the period between trains of pulses;

(f) associating a function key of the universal remote control device **10** with the time duration of the train of pulses and the list of instructions for generating a replica of the train of pulses;

(g) determining whether or not repetitions of the transmission of train of pulses is present;

(h) ignoring repetitions of the train of pulses;

(i) noting that repetitions are present; and

(j) storing for use in a universal remote control device, the information acquired in steps (c), (d), (e), (f) and (i).

Typically, each pulse has a fixed duty cycle and in carrying out the above described method it can be assumed that each pulse has a fixed duty cycle.

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The manual and computer steps followed in practicing this method are set forth in FIGS. **12A** and **13A**.

FIG. **12A** is a flow chart of the first part of this method for capturing an IR code and FIG. **12B** is a graph of a pulse train comprising a portion of the code.

There is shown in FIG. **12B**, adjacent the transforming step in FIG. **12A**, a graph of the waveform of the captured, and later recreated, infrared codes, showing when the infrared signal is on and when it is off. When the CPU **56** executes the instructions set forth below the waveform in FIG. **12B**, infrared-emitting LEDs, LED **1**, LED **2**, and LED **3** are turned on when the instruction IR-ON is executed and turned off when the instruction IR-OFF is executed. No operation is performed when the instruction NOP is called for. In this way the infrared codes are transformed into a bit stream of 0's and 1's.

FIG. **13A** is a flow chart of a second part of the method for capturing an IR code.

FIG. **13B** shows the IR infrared bitstream and an envelope of the filtered bitstream.

FIG. **13C** shows the filtered waveform that is analyzed for repetition. The repetition scheme and a pointer to indicate, upon regeneration of the infrared code, wnhich key will generate that code are stored in a memory for later inputting into the RAM **54**.

FIG. **14** is a flow chart of a sequence of eleven (11) steps that a user initiates to generate a specific IR code for performing a specific function, namely, for generating a captured IR code stored in the remote control device **10**. The code data is stored in the RAM **54** of the remote control device **10** and the sequence of steps the circuitry **42** goes through to take the code data in the RAM **54** and generate the infrared code therefrom is set forth in this Figure.

FIG. **15** is a plan view of the keyboard **61** and shows the different keys or pushbuttons **25** of the control device **10** extending through the base panel **14** of upper housing member **12** and the face panel **18** where the label or identification for each pushbutton or key **25** is shown. The light emitting diode, LED **4**, is also indicated.

FIG. **16** is a flowchart of the steps initiated by a user of the device **10** in a step and set procedure for searching for code data in the device **10** for the infrared code needed to operate the user's specific apparatus and to set the device **10** for that code data.

FIG. **17** is a flow chart of the steps initiated by a user in carrying out a direct-entry/quick-set procedure for matching the user's equipment or apparatus to the device **10**.

The steps of this procedure include:

STEP 1. Look up make and model number of the controlled apparatus in a table provided to the user in an instruction booklet.

STEP 2. Model number is found and matched with a series of 8"R"s and "G"s.

STEP 3. Here the operator presses the desired mode button or key.

STEP 4. Press DO, Enter, Recall. This tells the device **10** to do a Quick-Match.

STEP 5. Next enter the sequence of eight red and green blinks found in TABLE I (set forth below) provided in the instruction booklet. This is done by pressing Channel Down for "R" and Channel Up for "G".

STEP 6. Here a determination is made if a key other than Channel Up or Channel Down, was pressed.

STEP 7. The device **10** tricolor LED **4** will flash red or green depending on what button is pushed.

STEP 8. When all eight codes are entered, the program goes on to STEP 9.

STEP 9. Here a check is made to see if the blink code is in the table in the RAM **54** of the remote control device **10**.

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STEP 10. If the device **10** has successfully Quick-Matched to the controlled apparatus, the LED **4** will flash green twice.

STEP 11. If it did not match, it will flash yellow indicating that codes for that controlled apparatus are not loaded into the RAM **54**.

TABLE I

DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS
Blink Code
A B C D E F G H

TELEVISION SETS
RRRR RRRR
  Display
        MTS Pict + Pict – Sleep TV/Video
                    Ant Tone
    25 = Col Up
      26 = Col Dn
        27 = Brt Up
          28 = Brt Dn
            29 = Hue Up
              30 = Hue
                31 = Mtx
                  32 = Reset
                    Dn
RRRG RRRG
  Screen Sp Phne/
        Auto On/AutoOff/
            Ant Stereo
  Dn Prnt Ctl
        Data Ent
          Data Clr
RRRG RGRG
  Add Clear
RRRG GRRR
  A Ch Hi Fi
RRRG GRGR
  Ant/Aux
        Time/Ch Program TV/VCR
RRRG GGGR
  Ant/Aux
        Time/Ch
RRRG GGGG
  Pwr On Pwr Off Display Ant
GRRG RRRG
  Aux Last Ch Timer
GRRG RRGG
  Fine Up
        Fine Dn L Ctl R Ctl OBC Func Review
                      BiLing
    25 = Stereo
      26 = TimeFa
        27 = Timer
          28 = TimeSl
            29 = TV/AV
GRRG RGRR
  Fine Up
        Fine Dn L Ctl R Ctl OBC Func Review
                      BiLing
    25 = Stereo
      26 = TimeFa
        27 = Timer
          28 = TimeSl
            29 = TV/AV
GRRG RGGR
  Tint R Tint L Color R Color L
              Contr R
                  Contr L
                    Timer Stereo
  24 = SAP
    25 = Reset
      26 = Q/V
        27 = EXP
          28 = Disp
            29 = Mono
              30 = Lock
                31 = TV

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TABLE I-continued

DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS
Blink Code
A B C D E F G H

  32 = Ext 1
    33 = Ext 2
      34 = Ant
GRRG GRRG
  TV/Video
        Time
GRRG GRGR
  TV/Video
        Wide Lvl Up Lvl Dn Memory Func MTC Stereo
    25 = Timer
      26 = 100
        27 = BiLing
GRRG GRGG
  10 11 12 13
GRRG GGRR
  RF12 Ch Rtn Str SAP Mono Timer T Set TV/CATV
                      TV/Vid
    26 = 100
      27 = Audio
        28 = CCC1
          29 = CCC2
            30 = CCC3
              31 = 32 = 33 =
    34 = Pict
      35 = Reset   CCC4 ContDn
                        ContUp
GRGG RRRR
  Sleep Review
GRGG RRRG
  K L
GRGG RRGR
  SAP Sleep TV/Video
GRGG RRGG
  Program
        Q Rev SAP Sleep TV/Video
                      Add Delete
GRGG RGRG
  Sleep St/SAP TV/Video
GRGG RGGR
  11 12 13 14 15 16
GRGG RGGG
  K L
GRGG GRRR
  K L
VIDEO CASSETTE RECORDERS
RRRR RRRR
  Nse Cncl
RRGR RRRG
  Ant
RRGR RRGR
  Ant
RRGR RRGG
  Frm Adv
        Slow Slow Up Slow Dn
                Srch Fwd
                    Srch Rev
RRGR RGRR
  A B C D E F Slow
RRGR GGGR
  Slow
RRGR RGGR
  Slow + Slow – Eject CM Skip
              Program
                    Input Mode AM/PM
    28 = Shift
      29 = Reset
        30 = Mem/PS
          31 = SR
RRGR RGGG
  Forward
        FlshBack
            Ant Vol + Vol – Reverse
                    Sp Phne
                    PC

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<table>
<tr><td>13</td><td>14</td></tr>
</table>

TABLE I-continued

DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS
Blink Code
A B C D E F G H

RRGR GRRR
  Ant/Aux
RRGR GRRG
  11 12 13 14 15 16
RRGR GRGR
  Frm Adv
    Memory Reset Chg Time
RRGR GGRR
  Pwr On Pwr Off
RRGR GGGG
  Slow Slow Up Slow Dn Set Up Set Dn Timer Clear Display
  29 = Frame
    30 = Memory
      31 = Prog
        32 = Qtr
          33 = QtrStr
            34 = Quick
              35 = 36 = Rst
  37 = Clock
    38 = APS
      39 = 100   Remain
GGRG RRRR
  K L
GGRG RRRG
  CFM Slow
GGRG RRGR
  Slow OSP   Shift L Shift R
          SlowDn
            Slow Up
              St + St –
  28 = Timer
GGRG RRGG
  11 12 13 14 15 16 Slow
GGRG RGRR
  Slow Dn
    Slow Up Slow
CABLE CONVERTERS
RRRR RRGR
  A/B Add Delete Set Lock Last Ch
RRRR RRGG
  A B Event(*)
        #   Arrow Up
           Arrow Dn
            AP Delete
  25 = F26 = K 27 = Learn
    28 = PGM
      29 = TCP
        30 = Enter
RRRR RGRR
  Skew L Skew R Audio SAT Ant East
            Ant West
RRRR RGRG
  Plus Minus Dot Box Str Clear Time Auth
  22 = C/R
    23 = #
RRRR RGGR
  Prog Auth
RRRR RGGG
  Auth
RRRR GRRR
  Auth Prog
RRRR GRRG
  Plus Minus Rcp * M1 M2 M3 M4
RRRR GRGR
  A-B Dot1 Dot2 * Am Dm F
RRRR GRGG
  Arrow Up
    Arrow Dn
COMPACT DISK PLAYERS
RRRR RRRR
  CD Fwd CD BckUp

TABLE I-continued

DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS
Blink Code
A B C D E F G H

GRRG GRGG
  Fwd Indx
    Rev mdx
      Repeat Memory

For numbered functions, press "DO" then the two digit number.

For numbered functions, press "DO" then the two digit number.

FIG. **18A** is a flow chart of the steps for setting a "DO" command macro, for achieving a function that normally requires the actuation of several buttons, by programming one particular button to perform the functions required of the several buttons to achieve a specific function.

FIG. **18B** is a flowchart of the simple two pushbutton steps required for executing the "DO" macro command created in FIG. **18A**.

FIG. **19A** sets forth the steps initiated by a user to determine the various blink codes which identify what equipment or apparatus the remote control device **10** is set for.

FIG. **19B** illustrates a sample blinking grid of eight red and green blinks which will be presented o the user. Once a particular pattern of eight red or green blinks has taken place, the user of the device **10** will look up the blink pattern or code in TABLE I included in a user handbook. This table shows the user which pushbuttons **25** labeled A–H are associated with additional functions stored which may be stored in the RAM **54**. Additional functions beyond the eight supported by pushbuttons A–H are performed by pushing "DO", and then the two-digit sequence shown in TABLE I.

The instructions for using the control device **10** which are supplied to a purchaser thereof in an instruction booklet are set forth below.

Matching the Device to Your Equipment

The device **10** can control most remote controlled TV's, VCR's, cable converters, and CD players, but it needs the user's input to match it to your particular equipment. The easiest way to do this is to STEP-and-SET your device **10**. You will only need to do this once for each different type of device you have.

  1. To STEP-and-SET your device **10**, first press DO, Enter.

  2. Press one of the following equipment selection buttons to tell the device **10** what kind of equipment to match.

VCR1	Cable	TV
VCR2	CD	

  3. Aim the device **10** at the equipment and try various function buttons to see if the equipment responds correctly. Make sure you are reasonably close to the equipment and that nothing is blocking the path. The light (LED **4**) at the top of the device **10** will shine green whenever it is sending an infrared code, or it will not light at all if it does not send a code for a particular button.

  4. If your equipment did not respond correctly or did not respond at all, press DO1 to change the device **10** so that it will send the next set of infrared codes in its

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<table>
<tr><td>15</td><td>16</td></tr>
</table>

library, or press DO2 to change it so it will send the previous set of codes.

5. When your use DO1 or DO2 to step the device **10** setting forward or back, its light will blink yellow each time you step it. The settings step around in a circle. Whenever you get back to the setting where you started the device **10** light will blink red to notify you.

6. Use DO1 and DO2 to step through the sets of codes and keep trying out functions until your equipment responds correctly. The device **10** will fhen be set to send the proper infrared codes for operating your particular equipment.

7. When you are satisfied that the device **10** is properly matched, press DO, or any of the equipment selection buttons to restore the DO1 and DO2 buttons to their normal functions.

8. If your equipment is responding to your device **10** but some buttons are causing the wrong thing to happen, keep going. Some equipment responds to the infrared codes of other brands of equipment.

9. If your try out all of the codes in the device **10** library and your equipment still does not respond, it is probably because the code data for generating the infrared codes for operating your equipment is not in the library of your control device **10**.

The Keyboard **61**

Take a look at the keyboard. There are four groups of buttons:

1. Equipment Selection Buttons tell the device **10** which equipment is to be controlled:

VCR1	Cable	TV
VCR2	CD	

2. Basic Function Buttons are used to control your TV, VCR, CABLE and CD. They work in much the same way as in older remotes which typically have the following buttons.

			Power
Rec.	TV.VCR	Stop	Pause
Rewind	Reverse	Play	Fast Fwd
			Mute
1	2	3	Vol.Up
4	5	6	Vol.Dn
7	8	9	
	0	Enter	Chan.Up
		Recall	Chan.Dn

3. Extended Function Buttons perform any special functions your equipment may have, such as color control, picture control, tint control, etc. These buttons are identified with the following alphabet letters.

A	C	E	G
B	D	F	H

4. DO Buttons are used to perform very powerful DO Commands which are explained below.

Special Features

Besides the basic functions such as channel up/down and volume up/down that most TV remote controls have, there could be special features as well, for example:

Color up/down.
Picture up/down.
Tint up/down.
Sleep.
Your VCR's remote control can also have special features such as:
Frame advance
Channel up/down
Your cable converter remote control can also have additional features such as:
Channel recall
Delete
Your CD player remote control can have special features such as:
Repeat
Track programming

Once you have matched the device **10** to your TV, VCR, Cable Converter and CD player, all functions that were controlled by your old remote control devices can now be controlled by the device **10**. You may even notice some extra features that weren't controlled by your old remote.

Since the device **10** can control such a wide range of equipment, there is not enough room on it for buttons for every possible feature of every remote control. Instead, there are eight extended function buttons at the bottom labelled A through H. To find out what these eight buttons control for your particular TV, VCR, cable converter and CD player:

1. Get your pen and paper ready.

2. Press DO and then the button (TV VCR1 VCR2 Cable CD) of the device you want to know the special features of.

3. The device **10** will blink "red" or "green" 8 times. Every time it blinks "red" write down an "R". Every time it blinks "green" write down a "G". When you're finished writing it should look something like this:

RRRGRRRG

This is the "Blink Code" for your device. If your miss it the first time around, just press DO and the device button a second time.

4. Look at TABLE I and find the sequence of "R"s and "G"s that matches the one you wrote down.

5. Read the special features chart next to your Blink Code sequence which tells you what functions the A through H buttons control for your particular device.

For example, the feature chart of your TV might read:

A: Color Up	C: Picture Up
B: Color Down	D: Picture Down

6. To turn the color up in this example, you would press TV (of course if the device **10** is already set to control your TV, your do not have to press TV again but it doesn't hurt if you do so), then A.

7. To turn the color back down, you would just press B.

8. Write down what special functions are controlled by the A through H buttons on the handy stick-on labels enclosed with the control device **10**.

9. After writing down the special functions on the labels, stick them on to the back of the control device **10** for quick and easy reference.

If The Controlled Equipment Has More Than 8 Extended Functions

Usually, the eight A through H buttons are enough for most controlled equipment. If they're not, don't worry. If

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your controlled equipment has more than eight special features these too are controlled by the device **10**.

Beyond the A through H function buttons, any additional functions are performed by pressing DO then two of the 0–9 number buttons. For example, your TV's feature chart may show additional functions like these:

| 25: SAP | 26: Reset | 27: Q/V |
| 28: Display | 29: Mono | 30: Stereo |

If you did have these features and wanted to use them, you would press DO and then the two-digit number for that feature. For example, you might:

Press DO,3,0. This would turn your TV's stereo broadcast feature on.

If you use a feature like this frequently you may want to assign it to a DO command, our next topic of discussion.

Setting DO Commands

DO Commands give you the power to perform a multitude of different functions with the push of just one or two buttons. DO Commands let you assign any of the following buttons to tell the device **10** to automatically perform a series of keystrokes you use often:

	DO1	D02	
Rec	TV.VCR	Stop	Pause
Rewind	Reverse	Play	Fast Fwd.
		Mute	
		Vol.Up	
		Vol.Dn	
	Enter	Chan.Up	
		Chan.Dn	
A	C	E	G
B	D	F	H

To tell the device **10** to do what you want, your must teach it. As an example, you can teach the device **10** to turn your whole system on and set the TV to channel **4** by doing the following:

1. Press DO, Recall. This tells the device **10** that you want to teach it something to do.
2. Next, your must assign a button **25** you will use to DO whatever you teach it. You can use any of the device **10**'s buttons **25** set forth above. For example, let's use DO1 at the top of the keyboard: Press DO1.
3. Now, you must tell the device **10** what button sequence you would press to turn your whole system on and set the TV to channel 4.
4. Press TV Power. This tells the device **10** to turn your TV on.
5. Press 4, Enter (pressing Enter may not be required for your TV). This tells the device **10** to set your TV to channel 4.
6. Press VCR, Power. This tells the device **10** to turn your VCR on.
7. Press Cable, Power. This tells the device **10** to turn your cable converter on.

Now you have pressed all the buttons you want the device **10** to learn for this example.

8. Press DO, Recall. This tells the device **10** that you are finished teaching it and to remember what you have taught it.

Now the device **10** knows how to turn your TV, VCR, and cable converter on and set the TV to channel 4, just by pressing one button.

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9. Aim the device **10** at your equipment and press DO1. Make sure you keep the device **10** pointed at your equipment while the light is flashing.

Now that you know how DO Commands work, you can teach the device **10** to "DO" practically any sequence of keystrokes. Just remember to keep the following in mind:

To perform a DO Command, press DO then the button you assigned to remember the DO Command. However, if you assigned the DO1 or DO2 buttons to remember a DO Command, you do not have to press DO first, just press DO1 or DO2.

If the device **10** light (LED **4**) starts blinking green, yellow, red while you are trying to teach it, it is telling you that RAM **54** is full. The DO command you are teaching is automatically erased. You can teach the device **10** a shorter DO command, or erase some other DO command you have already taught the device **10** to obtain more memory space.

After the DO Command is finished, the last apparatus **10** selected within the DO Command will be the apparatus the device **10** will work with next.

Erasing a DO command

If you just want to change a DO Command, you do not have to erase it first—just set up the new DO Command in its place. However, to get rid of a DO Command without replacing it with a new one:

1. Press DO Recall.
2. Press the button you have assigned to the DO command that you want to erase. For example, to erase the DO command you taught the device **10** in the above example:

Press DO1.

3. Press DO, Recall again. The old DO Command is now erased.

QUICK-MATCHING To Your Equipment

There is a quicker way to match your equipment to the device **10** by Quick-Matching. Quick-Matching is a way to set the device **10** directly to match any controlled equipment in its library. Follow the steps below to do a Quick-Match:

1. Match the device **10** to your equipment using STEP-and-SET.
2. Press DO, then the desired device button (TV, VCR1, VCR2, Cable or CD). The device **10** light will blink red or green eight times.
3. Write down the sequence of red and green blinks. This is the "Blink Code" for the particular device.
4. Press DO Enter Recall. This tells the device **10** to do a Quick-Match.
5. Enter the correct sequence by pressing Ch Dn for "R" and Ch Up for "G". The device **10** light (LED **4**) will flash "red" or "green" depending on what button you push. The Ch Dn and Ch Up buttons **25** are labelled with the correct color for each.
6. When the device **10** has successfully Quick-Matched your equipment it will automatically flash green twice. If it did not match, it will flash yellow. If it fails to Quick-Match, it is probably because the requisite code data is not stored in the library in your device **10**.

QUICK-MATCHING Between Controlled Equipment

One of the great benefits of Quick-Matching is that you can switch the device **10** functions between the remote controlled TVs, VCRs and cable converters you may own. This is done by using "Quick-Match" within a "DO command".

Let's suppose you have two TVs in your house and only one device **10**. Here's how to switch between them:

1. Press DO Recall. the button you want to use to switch to your other TV set.

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For example, press DO2. This tells the device **10** that you want to teach it a DO Command.

2. Press DO Enter Recall. This tells the device **10** that you want to do a Quick-Match.

3. Enter the R and G blink sequence of the second TV you want to control by pressing Ch Dn for "R" and Ch Up for "G".

4. Press DO, Recall. This tells the device **10** that you are finished teaching it a "DO command".

Now, to set the device **10** to control your second TV, press DO2. This tells the device **10** that you will be controlling your second TV.

To go back to controlling your first TV, simply teach device **10** another "DO command". Just repeat the steps above, except use a different button and the correct R and G sequence for your first TV.

The device **10** can easily be taught to control a whole houseful of infrared remote controlled equipment—just teach the device **10** a DO Command to QUICK-MATCH each additional piece of equipment.

In FIG. **20** is shown a unique signal coupling and converting assembly **206** which includes a connector assembly **207**, a cable **208** and a special cover plate **210** for the battery compartment **45**. The cover plate **210** has on the underside thereof three pins **212**, **214** and **216** which are positioned to connect with the three serial ports 1, 2 and 3. The pins **212**, **214** and **216** mounted to the cover plate **210** are connected by three wire conductors **224**, **226** and **228** in cable **208** to connector assembly **207** which has conversion circuitry **230** therein. The connector assembly **207** has a nine pin array **250** of sockets **251**–**259** for receiving nine pins and the conversion circuitry **230** which enables one to use some of the nine sockets **250** of the connector assembly **207** for communication with the three pins **212**, **214**, **216** that are connected to the serial ports **1**, **2** and **3** as shown in FIGS. **21** and **22**.

FIGS. **21** and **22** are a schematic diagram of the conversion circuitry **230**.

In FIG. **21** is shown circuit portion **230A**. In this circuit portion, plus nine volts goes into pin **4** of connector DB-**9** or pin **20** of connector DB-**25** and minus 9 volts goes into pin **7** of DB-**9** or pin **4** of connector DB-**25**, which are connected to the circuit portion **230A** of the conversion circuitry **230**. This provides a constant source of positive and negative voltage and is used as the power supply for the circuit. Note that two different types of personal computer host female connectors can be used, namely, female connector DB-**9** or female connector DB-**25** in the connector assembly **207**.

Serial information is transmitted by the hand held control device **10** via line HTXD at serial port **1** and is level translated by the operating circuitry **42** from a range of from plus 5 volts to zero volts to a range of from minus 9 volts to plus 9 volts.

In this respect, when 0 volts is present at serial port **1**, transistors Q1 and Q2 are turned on such that +9 volts is supplied from pin **4** of connector DB-**9** or pin **20** of connector DB25 through transistor Q1 to pin **2** of connector DB-**9** or pin **3** of connector DB-**25**.

Then, when +5 volts is present at serial port **1**, the emitter-base of transistor Q2 is reverse biased, turning off transistor Q2 which turns off transistor Q1. As a result, the 9 volts at pin **7** of connector DB-**9** or pin **4** of connector DB-**25** is supplied through resistor **270** to pin **2** of connector DB-**9** or pin **3** of connector DB-**25**.

The circuit portion **230B** is shown in FIG. **22** and performs a receiving function for the control device **10**. When pin **3** of connector DB-**9** or pin **2** of connector DB-**25** is at

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–9 volts, its normal resting state, then HTXD at serial port **3** is at 0 volts. When pin **3** of connector DB-**9** or pin **2** of connector DB-**25** goes to +9 volts, HTXD at serial port **3** goes to plus 5 volts. Pin **5** of connector DB-**9** or pin **7** of connector DB-**25** is directly connected to serial port **2** and always stays at ground.

In transmitting data to the control device **10**, the programming computer supplies +9 v or –9 v to pin **3** of connector DB-**9** or pin **2** of connector DB-**25**. When +9 v is present on IBMTXD, 4.3 volts established by Zener diode **272** is passed through diode **274** to serial port **3**.

When –9 v is present on IBMTXD, the Zener diode **272** clamps to –0.6 volts resulting in conduction through transistor Q3 pulling serial port **3** to 0 volts.

The diode **274**, the transistor Q3 and a resistor **276** connected as shown are provided to allow pressing a key **25** on keyboard **26** to "wake up" CPU **56** (actuate the wake up circuit **70**) even though circuit portion **230B** is connected to the control device **10**.

From the foregoing description, it will be apparent that the universal remote control device **10**, the signal coupling and converting assembly **206**, the disclosed methods of learning and storing infrared codes, and the methods for operating the control device **10** of the present invention have a number of advantages, some of which have been described above and others of which are inherent in the device **10**, assembly **206** and the methods of the invention disclosed herein. For example:

(1) With no ROM in the circuitry **42**, the instruction codes and code data in the RAM **54** can be upgraded at any time via the serial ports **1**, **2** and **3**.

(2) By loading the instruction codes and initial code directly into the RAM **54** by tri-stating the CPU **56**, the circuitry **42** is enabled to function without a ROM.

(3) The serial ports **1**, **2** and **3** together with the signal coupling and converting assembly **206** enable new data to be input into the circuitry **42** from an RS-232 interface device to the serial ports **1**, **2** and **3**.

(4) The visible LED **4** providing red/green/yellow/off blink code provides a means for communicating to the user where the device **10** has "landed" after searching for codes to control a specific apparatus. The user can then look up in the instruction booklet what extended functions are available via the letter keys A–H or number keys, plus the DO key for that particular apparatus or equipment.

(5) The write-protect circuit **78** prevents corruption of the operating program or data in the RAM **54** during transient states when the microprocessor is being turned on or turned off.

(6) The multiplexing of the address and data lines between the RAM **54** and the CPU **56** enables scrambling of the instruction codes and the code data so that the memory image in the RAM **54** is encrypted.

(7) The construction of the keyboard **61** enables one to have 56 keys which can be decoded using only 8 bidirectional input (and output) ports **63**.

(8) The keyboard **61** including the keyboard circuitry **62** plus the wakeup circuit **70** provides a system whereby pressing any key turns on power to the CPU **56**.

(9) The provision of three infrared LEDs **1**, **2** and **3** with no current-limiting resistors enables the device **10** to use maximum energy to create the infrared control pulses with a minimum amount of energy wasted.

(10) The DO keys together with the numeral and letter keys allow a number of DO functions to be performed with the device **10** by a user.

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(11) Any combination of products can be controlled with the universal remote control device **10**.

(12) The step-and-set method for locating the code data for generating the infrared code necessary to operate the user's equipment or for the user to learn that such code data is not present in the library in the RAM **54**.

Also modifications can be made to the device **10**, the assembly **206** and the described methods of the present invention without departing from the teachings of the present invention. Accordingly, the scope of the invention is only to be limited as necessitated by the accompanying claims.

What is claimed is:

1. In a universal remote control comprising a keyboard having a plurality of pushbuttons including a macro push-button and a library of codes and data for use in transmitting operating commands to a plurality of different home appliances of different manufacturers, a readable medium having instructions for performing steps comprising:

   matching the universal remote control to a plurality of different home appliances of different manufacturers such that selected codes and data from the library are used to transmit operating commands to the matched home appliances in response to activation of selected pushbuttons of the keyboard, the pushbuttons of the keyboard being activated to directly identify each of the plurality of different home applicances of different manufacturers to which the universal remote control is to be matched; and

   assigning to the macro pushbutton a subset of the selected codes and data from the library whereafter activation of the macro pushbutton causes the universal remote control to use the subset of selected codes and data from the library to transmit a plurality of operating commands to one or more of the matched home appli-ances.

2. The readable medium as recited in claim **1**, wherein the instructions further perform the step of using activation of one or more pushbuttons of the keyboard to assign the subset of the selected codes and data from the library to the macro pushbutton.

3. In a universal remote control comprising a keyboard having a plurality of pushbuttons and a library of codes and data for use in transmitting operating commands to a plu-rality of different home appliances of different manufacturers, a readable medium having instructions for performing steps comprising:

   matching the universal remote control to a plurality of different home appliances of different manufacturers such that selected codes and data from the library are used to transmit operating commands to the matched home appliances in response to activation of selected pushbuttons of the keyboard; and

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   using activation of one or more pushbuttons of the key-board to match the universal remote control to the plurality of different home appliances of different manufacturers;

   instructions further perform the step of using activation of one or more of the pushbuttons of the keyboard to directly identify each of the plurality of different home appliances of different manufacturers to which the universal remote control is to be matched.

4. In a universal remote control comprising a keyboard having a plurality of pushbuttons including a macro push-button and a library of codes and data for use in transmitting operating commands to a plurality of different home appli-ances of different manufacturers, a method comprising:

   matching the universal remote control to a plurality of different home appliances of different manufacturers such that selected codes and data from the library are used to transmit operating commands to the matched home appliances in response to activation of selected pushbutton of the keyboard, the pushbutton of the keyboard being activated to directly identify each of the plurality of different home appliances of different manufacturers to which the universal remote control is to be matched; and

   assigning to the macro pushbutton a subset of the selected codes and data from the library whereafter activation of the macro pushbutton causes the universal remote control to use the subset of selected codes and data from the library to transmit a plurality of operating commands to one or more of the matched home appli-ances.

5. The method as recited in claim **4**, further comprising using activation of one or more pushbuttons of the keyboard to assign the subset of the selected codes and data from the library to the macro pushbutton.

6. In a universal remote control comprising a keyboard having a plurality of pushbuttons and a library of codes and data for use in transmitting operating commands to a plu-rality of different home appliances of different manufacturers, a method comprising:

   matching the universal remote control to a plurality of different home appliances of different manufacturers such that selected codes and data from the library are used to transmit operating commands to the matched home appliances in response to activation of selected pushbutton of the keyboard; and

   using activation of one or more pushbuttons of the key-board to directly identify each of the plurality of different home appliances of different manufacturers to which the universal remote control is to be matched.

*   *   *   *   *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.   : 6,587,067 B2   Page 1 of 1
DATED   : July 1, 2003
INVENTOR(S) : Paul V. Darbee et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

<u>Column 22,</u>
Line 5, insert -- wherein the -- before "instructions"
Line 20, the second "pushbutton" should be -- pushbuttons --
Line 46, "pushbutton" should be -- pushbuttons --

Signed and Sealed this

Fourteenth Day of September, 2004
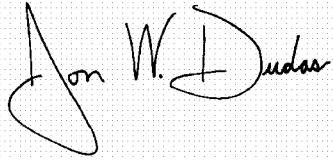
JON W. DUDAS
Director of the United States Patent and Trademark Office

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(12) **EX PARTE REEXAMINATION CERTIFICATE** (8031st)

United States Patent

Darbee et al.

(10) **Number:** US 6,587,067 C1

(45) **Certificate Issued:** Feb. 15, 2011

(54) **UNIVERSAL REMOTE CONTROL WITH MACRO COMMAND CAPABILITIES**

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Related U.S. Application Data

(63) Continuation of application No. 09/408,729, filed on Sep. 29, 1999, now Pat. No. 6,195,033, which is a continuation-in-part of application No. 07/990,854, filed on Dec. 11, 1992, now Pat. No. 6,014,092, which is a continuation-in-part of application No. 07/913,523, filed on Jul. 14, 1992, now abandoned, which is a continuation-in-part of application No. 07/586,957, filed on Sep. 24, 1990, now abandoned, which is a continuation-in-part of application No. 07/127, 999, filed on Dec. 2, 1987, now Pat. No. 4,959,810, which is a continuation-in-part of application No. 07/109,336, filed on Oct. 14, 1987, now abandoned.

(51) **Int. Cl.**
G08C 19/28	(2006.01)
G08C 23/04	(2006.01)
G08C 19/16	(2006.01)
G08C 23/00	(2006.01)
H03J 1/00	(2006.01)
H04B 1/20	(2006.01)
H04B 10/10	(2006.01)
H04N 5/44	(2006.01)
H01H 9/02	(2006.01)

(52) **U.S. Cl.** **341/176**; 341/173; 345/169; 345/171; 384/E5.096

(58) **Field of Classification Search** .... None
See application file for complete search history.

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Primary Examiner—Woo H Choi

(57) **ABSTRACT**

A universal remote control comprising a keyboard having a plurality of pushbuttons including a macro pushbutton and a library of codes and data for use in transmitting operating commands to a plurality of different home appliances of different manufacturers. Instructions within the remote control are used match the universal remote control to a plurality of different home appliances of different manufacturers such that selected codes and data from the library are used to transmit operating commands to the matched home appliances in response to activation of selected pushbuttons of the keyboard. The instructions are also used to assign to the macro pushbutton a subset of the selected codes and data from the library whereafter activation of the macro pushbutton causes the universal remote control to use the subset of selected codes and data from the library to transmit operating commands to one or more of the matched home appliances.

SETTING A "DO" COMMAND MACRO

* eq. TV, POWER, VCR 1, POWER, PLAY, TV, 3, ENTER

A001063

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EX PARTE
REEXAMINATION CERTIFICATE
ISSUED UNDER 35 U.S.C. 307

NO AMENDMENTS HAVE BEEN MADE TO
THE PATENT

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AS A RESULT OF REEXAMINATION, IT HAS BEEN
DETERMINED THAT:

The patentability of claims **1-6** is confirmed.

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